SIXTH . . . .
ANNUAL CATALOGUE

MONTANA STATE COLLEGE

OF

AGRICULTURE

AND

MECHANIC ARTS

BOZEMAN, MONTANA

FOR

1897-9~~8~~9

WITH ANNOUNCEMENTS FOR
1898-99

Learning and Labor.
LIBRARY
OF THE
University of Illinois.
CLASS. BOOK. VOLUME.
C M76H 1897-99
Accession No.

MONTANA STATE COLLEGE OF AGRICULTURE AND MECHANIC ARTS

MAIN BUILDING CHEMICAL AND PHYSICAL LABORATORY DRILL HALL EXPERIMENT STATION

SIXTH ANNUAL CATALOGUE

MONTANA STATE COLLEGE

= = OF = =

AGRICULTURE

= = = AND = = =

MECHANIC ARTS,

BOZEMAN, = = = MONTANA.

FOR THE ACADEMIC YEAR 1897=98

AND ANNOUNCEMENTS

FOR 1898=99.

BOZEMAN CHRONICLE
1898.

K

CALENDAR FOR 1898-99.

1898.

Registration Examinations for Entrance and Conditions	Monday, Sept. 12, 9 A. M.
Fall Term begins	Wednesday, September 14, 9 A. M.
Thanksgiving Recess begins	Thursday, November 24;
	ends Monday, November 28, 9 A. M.
Fall Term closes	Friday, December 16.

1899.

Winter Term begins	Monday, January 2, 9 A. M.
Winter Course in Agriculture begins	Monday, January 2.
Winter Course in Agriculture ends	Friday, March 31.
Winter Term ends	Friday, March 31.
Spring Term begins	Monday, April 3.
Exhibition of Literary Societies	Friday, June 9.
Baccalaureate Day	Sunday, June 11.
Preparatory and Undergraduate Exhibition	Monday, June 12.
Annual Concert	Tuesday, June 13.
Commencement Day	Wednesday, June 14.

Field Day, which consists of a series of athletic contests, will be held about the end of the Spring Term.

MONTANA STATE BOARD OF EDUCATION.

GOVERNOR ROBERT B. SMITH, (ex-officio)	Helena
ATTORNEY GENERAL C. B. NOLAN, (ex-officio)	Helena
STATE SUPT. OF PUBLIC INSTRUCTION, E. A. CARLETON, (ex-officio)	Helena

O. F. GODDARD	Billings
J. E. KLOCK	Helena
(Term expires February 1st, 1899.)	
O. P. CHISHOLM	Bozeman
E. B. HOWELL	Butte
(Term expires February 1st, 1900.)	
H. R. MELTON	Dillon
M. J. GARRETT	Lewistown
(Term expires February 1st, 1901.)	
J. M. HAMILTON	Missoula
H. H. GRANT	Grantsdale
(Term expires February 1st, 1902.)	

OFFICERS OF THE BOARD.

GOVERNOR ROBERT B. SMITH,
President.

J. M. HAMILTON,
Vice-President.

E. A. CARLETON,
Secretary.

35335

EXECUTIVE BOARD,

In Charge of the College and the Experiment Station.

Nelson Story (Term expires February 1st, 1899.)	Bozeman
Walter Cooper (Term expires February 1st, 1899.)	Bozeman
George Kinkel, Jr (Term expires February 1st, 1900.)	Manhattan
Lester S. Willson (Term expires February 1st, 1901.)	Bozeman
Peter Koch (Term expires February 1st, 1902.)	Bozeman

OFFICERS OF THE BOARD.

Lester S. Willson,
President.

George Kinkel, Jr ,
Vice-President.

Peter Koch,
Secretary and Treasurer.

FACULTY.

JAMES REID, A. B. (McGill Univ.), PRESIDENT,
Professor of Mental, Moral and Political Science and Astronomy.

S. M. EMERY,
Professor of Horticulture.

FRANK W. TRAPHAGEN, PH. D. (Columbia), F. C. S.,
Professor of Physics, Chemistry and Geology.

W. H. WILLIAMS, B. E. E. (Univ. of Wisconsin),
Professor of Mechanical and Electrical Engineering.

E. V. WILCOX, PH. D. (Harvard),
Professor of Zoology and Veterinary Science.

WILL F. BREWER, M. A. (Iowa College),
Professor of Latin and English.

MRS. F. E. MARSHALL,
Professor of Art.

AARON H. CURRIER, A. M. (Oberlin),
Professor of French and German.

H. S. JENNINGS, PH. D. (Harvard),
Professor of Botany and Bacteriology.

GEO. P. AHERN, (U. S. M. A.), Capt. 25th Inf., U. S. A.,
Professor of Military Science and Tactics, and Instructor in Forestry.

MISS LILLA A. HARKINS, M. S. (S. Dak. Agr. Col.),
Professor of Domestic Science and Art.

ROBERT S. SHAW, B. S. A. (Ontario Agr. Col.),
Professor of Agriculture.

H. G. PHELPS,
Principal of Business Department.

MISS M. A. CANTWELL,
Principal of Preparatory Department.

W. M. COBLEIGH, E. M. (College of Montana),
Instructor in Chemistry and Physics.

MISS MAY TRAVIS, A. B. (Univ. of N. Dakota),
Instructor in Mathematics.

E. B. McCORMICK, S. B. (Mass. Inst. of Tech.),
Instructor in Mechanical Engineering.

MISS STELLA SHAFF,
Instructor in Stenography and Typewriting.

MISS KATE P. CALVIN,
Piano.

MRS. MARY WINTERS,
Librarian.

EXPERIMENT STATION STAFF.

S. M. EMERY, DIRECTOR,
Horticulturist and Agriculturist.
F. W. TRAPHAGEN,
Chemist.
E. V. WILCOX,
Zoology and Veterinary Science.
H. S. JENNINGS,
Botanist.
GEO. P. AHERN,
Forestry.
R. S. SHAW,
Assistant Agriculturist.
W. M. COBLEIGH,
Assistant Chemist.

HISTORY AND ENDOWMENT.

The College of Agriculture and Mechanic Arts is organized under an act of Congress of July 2, 1862. This act appropriated public lands to the several states for the purpose of aiding in the maintenance of Colleges:

> "where the leading object shall be, without excluding the scientific and classical studies, and including military tactics, to teach such branches of learning as are related to the Agricultural and Mechanical Arts."

The State of Montana, by an act approved Feb. 16, 1893, accepted and claimed the benefits and endowments provided under the Acts of Congress of July 2, 1862 and Aug. 30, 1890, the latter of which provides for the further endowment of these Colleges.

The income of the College is derived from the proceeds of the sale and lease of public lands donated to the State by the Federal government for the College, and which amount to 140,000 acres. An additional sum of $23,000 is appropriated for the year ending June 30, 1898, under the Morrill act of Aug. 30, 1890, to be increased $1,000 annually until it amounts to $25,000 a year. These funds with the addition of the State appropriations and the fees of students make a liberal endowment.

Trustees.—The general control of the institution is in the hands of the State Board of Education. The direct supervision is vested in an Executive Board of five members, one of whom is appointed yearly by the Governor, subject to the approval of the State Board of Education.

THE EXPERIMENT STATION.

In connection with the College, an Agricultural Experiment Station has been established. The object of this Station is to further the interests of the agricultural industries in the State of Montana. This is done by conducting researches and experiments which may include the physiology of plants and animals; the diseases to which they are severally subject, with remedies for the same; the chemical composition of useful plants at their different stages of growth; the comparative advantages of rotative cropping as pursued under a varying series of crops; the capacity of new plants or trees for acclimation; the analysis of soils and water; the chemical composition of manures, natural or artificial, with experiments designed to test their comparative effects on crops of different kinds; the adaptation and value of grasses and forage plants; the composition and digestibility of the different kinds of food for domestic animals; the scientific and economic questions involved in the production of butter and cheese; and such other researches or experiments bearing directly on the agricultural industry of Montana, as may seem advisable. For the support of this important department, the United States government appropriates yearly the sum of fifteen thousand ($15,000) dollars.

GENERAL STATEMENT.

The Montana State College of Agriculture and Mechanic Arts is the State School of Applied Science. The purpose is to give the young men and women of Montana an opportunity to acquire a good college education in Mathematics, Literature, Science and Art. The practical feature in instruction is emphasized, and while the text book, recitation and lecture are employed, the student is required to put into practice, as far as possible, the instruction he receives. This is attained by means of well equipped shops and laboratories. The work of the College is characterized throughout by the combination of the theoretical and practical.

Being a State institution, instruction is free to all residents of Montana of suitable age and acquirements. A small entrance fee is charged to cover incidentals and laboratory fees sufficient to cover the cost of material.

The following courses have been established, and the schedules of these courses with full descriptions may be found under each.

I. Course in General Science.
II. Course in Agriculture.
III. Course in Chemistry.
IV. Course in Home Science.
V. Course in Mechanical Engineering.
VI. Course in Electrical Engineering.
VII. Course in Preparatory Department.
VIII. Course in Music.
IX. Course in Book-keeping.
X. Course in Stenography and Typewriting.

MATERIAL EQUIPMENT.

LOCATION.

The site chosen for the College buildings and Campus is one of the most beautiful that could be imagined, being an elevation southwest of the city of Bozeman, and within the city limits. The city has been fitly named "Bozeman the Beautiful," seated as it is at the head of one of the most fertile valleys in the world, and enclosed by the peaks of the Bridger and Gallatin mountains. In the vicinity are some of the most picturesque canyons, and the botanist and geologist can find nowhere richer fields for study and observation.

In economic resources, both agricultural and mineral, and in scenic effects, nature has been most generous.

THE CAMPUS AND FARM.

The grounds and Farm contain about two hundred acres. Of this over thirty acres in the immediate vicinity of the buildings constitute the Campus and recreation grounds, sites for buildings and laboratories, the remainder being devoted to farm and experimental purposes.

BUILDINGS.

The Main Building, situated in the center of the College Campus, is a substantial structure of brick and stone, of practically fireproof construction, having a total length of

128 feet and a width of 90 feet. It is three stories high, and has a large, well lighted basement, which furnishes quarters for the Domestic Science Department and three class rooms. The first floor contains the library, four offices, and three large class rooms. The north half of the second floor is devoted to the Art Department, the arrangement being such that the three large rooms can be thrown together, by sliding doors, for exhibition purposes. The south half of this floor is fitted up entirely for the use of the Business Department, the arrangement being that of the best Business Colleges. The third floor contains the large Assembly Room, a draughting room, and six laboratory and music rooms. The building is well lighted and commands a magnificent view of the Bridger and Gallatin mountains, and the whole of the beautiful Gallatin Valley. All the laboratories and offices are furnished with gas, and the whole building will be lighted with electricity from our experimental plant in the Engineering Laboratory.

The Chemical and Physical Laboratory is west of the Main building, sixty by ninety feet in dimensions. It is built of pressed brick, and has two observatory towers, one at each end, and is three stories high including the basement.

There are two entrances, one at the north end, the other at the south. A very large stack containing flues for ventilation of the hoods and furnaces passes up through the center of the building.

The basement is occupied by the laboratory of advanced physics, with desks for twelve students; and the assay laboratory arranged for eight students. In addition to these, there are rooms for the preparation of samples for analytical work, with power crushing and grinding machinery. A large room is also available for a museum.

The main floor is occupied by the office and library, a lecture room to accommodate one hundred students, a preparation room, a small class room, and the Experiment Station laboratory.

The second story contains the laboratory for elementary physics, with sufficient capacity for forty-eight students, the laboratory for physical measurements for twenty-four students, the qualitative laboratory for twenty students, the quantitative laboratory for twelve students, and the mineralogical laboratory for twelve students. The instructor's laboratory is so situated as to give him oversight of all the laboratories, and renders it easy for a student to consult with him at any time.

The north tower is used for a meteorological observatory, and a fine set of registering instruments is installed in it.

The Shop Building is a one-story frame structure, 60 by 100 feet, situated back of the Main Building, and contains a machine shop 44 by 72 feet, a forge shop 27 by 30 feet, office, tool room, wash room, engine and blower room, and boiler room. The large blower which ventilates the Main and Chemical Buildings is located here, and is connected with those buildings by underground ducts.

The Engineering Laboratory is a two-story stone building, 33 by 52 feet, located 260 feet east of the shop building, and receives its steam supply from the main boiler through underground piping.

The Drill Hall is a one-story frame structure, 60 by 100 feet, situated between the Chemical Building and the Experiment Station, and is designed especially for military and athletic purposes.

The Experiment Station building is brick veneered, two stories high, with a large basement, and is situated on the west side of the Campus, adjoining the experiment farm. It has sixteen rooms, and contains the Biological Laboratories, the offices of the Director and the Assistant Agriculturist, and rooms for the Director's residence.

EQUIPMENT.

The Chemical Lecture Room is equipped with a porte-lumiere for use in experiments requiring projection. When cloudy weather interferes with the use of the porte-lumiere, the electric arc lamp or the oxyhydrogen lantern may be used for projection, all these instruments being arranged so as to be interchangeable.

A lecture desk extends across one end of the room, and is supplied with water, gas and electricity, with a hood which permits the making of experiments with which objectionable odors are associated.

A sufficient amount of apparatus has been secured to illustrate all of the important laws and phenomena of chemistry.

Physics.—For lecture room demonstration in physics we have a very large and carefully selected set of apparatus, with which it is possible to fully and practically illustrate the subject. An enumeration of the individual pieces would require much more space than is available in this catalogue, hence it is omitted.

Elementary Physics.—The instruction in elementary physics being given entirely by the experimental method, a considerable supply of apparatus is required. The more important pieces are: an Atwood's machine, balances and pyknometers for specific gravity determinations, spring balances for the resolution and composition of forces, air pump, Mariotte's tubes, rotating machine, siren, color discs, lenses, prisms, photometer, Holtz machine, electric batteries, galvanometers, dynamos, motors, and all the additional material required for a thorough elementary course.

Advanced Physics.—The laboratory work in Advanced Physics is that outlined in Sabine's Laboratory Course in Physical Measurements, which is Physics C of Harvard University. The course consists of a very carefully selected series of experiments. All of the apparatus necessary for this work is available, among these are micrometer callipers, a spherometer, balances, a torsion pendulum, a sonometer, a Kundt's tube, organ pipes, a Bunsen's photometer, a fine spectrometer, a magnetometer, a tangent galvanometer, Wheatstone's bridges, wire and box forms, batteries, etc.

The Assay Laboratory is provided with pulp scales for each student, five button balances, five Hoskin's crucible furnaces, large size, one number four and four number three Hoskin's muffle furnaces, one Brown's combination furnace, two power crushers, and a power grinder run by a 2 H. P. gasoline engine, a grinding plate, and a full set of samples illustrating every variation of ore in mine, mill and smelter.

The Laboratory for Qualitative Analysis, besides desks, and fume closets, has a large desk for special operations, every requisite for successful work being supplied.

In Quantitative Analysis, the students may draw from the supply room any apparatus they may desire for their work, consisting of platinum crucibles, dessicators, measuring flasks, pipettes, beakers, flasks, burettes, reagent bottles, stoves, etc.

One corner of this room is separated from the remainder by a sash partition, and serves for the balance room.

In Addition to the Standard Reference Books in science, and the principal books on its different branches, the department library contains the following complete files of scientific journals:

American Journal of Science and Arts, Journal of the American Chemical Society, Journal of Analytical and Applied Chemistry, Berzelius' Jahresbericht, Jahresbericht uber die Fortschritte der Chemie, etc., Berichte der deutschen Chemischen Gesellschaft, and many sets, more or less complete, of other journals.

This makes a reference library which is very valuable, and which will afford excellent material for aid in scientific research, covering, as it does, the progress of the science since 1820.

The Collections in mineralogy, geology and economic geology are very fine and extensive, and cover all the geological horizons.

The private collection of the professor, for many years used for the purposes of instruction, has been acquired. It is particularly rich in minerals of economic importance. The collection exhibited by Montana at the Columbian Exposition was presented by the State to the College, and gives an excellent view of our State's mining resources. A very large amount of duplicate material is constantly being used to increase our collections through the medium of exchange.

Two sets of crystal models, and the crystallized specimens in the collection are available for instruction in crystallography.

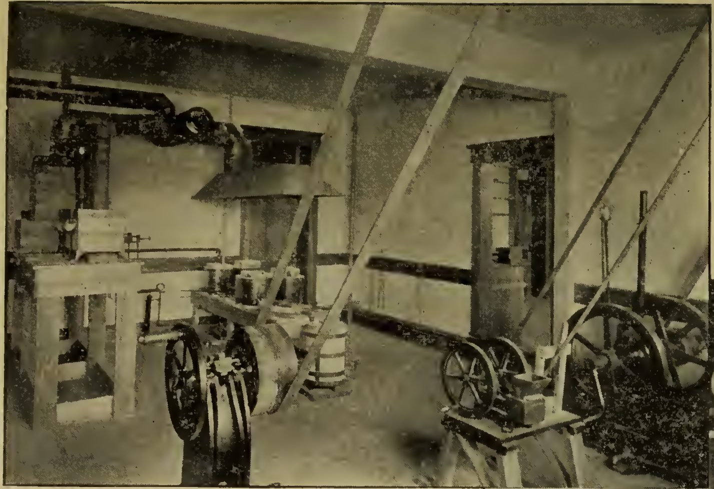
Shops.—The equipment in this line is now complete, and consists of the latest patterns of standard machines from the best makers in the country. Before selecting this machinery, the shops of several of the most prominent engineering schools in the United States were studied, and the aim has been to make our equipment a model one. Power is furnished by one of the latest type Imperial high-speed engines, of 65 H. P., which also drives the blower.

For Woodworking, five double and three single carpenter benches are provided, making accommodations for thirteen students at a time. Each side of these benches contains two drawers with complete sets of carpenter tools, and two lockers for exercises. Twenty-six students can therefore be accommodated, each having an individual set of tools, for the care of which he is held responsible. For wood turning and pattern making there are seven speed lathes, a pattern-making lathe, a scroll saw, a double revolving rip and cross-cut saw, a variety wood-worker, and a 20-inch surface planer.

For Machine Work there are four screw cutting lathes of 16-inch swing, and one of 18-inch swing; 13-inch, 20-inch, and 28-inch drills; a universal milling machine, a 16-inch shaper, a 22-inch by 22-inch by 6-foot planer, a universal tool grinder, a cutter and reamer grinder, a polishing lathe, and a shop saw. Benches for twelve students are provided. There is also room for adding additional equipment as the needs may develop. The tool room is well supplied with small tools, and the wash room contains lockers for students' use.

The Forge Room contains eleven forges. All the piping for both blast and exhaust is of tile and placed under the floor. The forges have down draft exhaust, keeping the room free from smoke and giving a very neat appearance. There is a full equipment of anvils and other necessary tools, and a power shear for cutting up stock.

The Engineering Laboratory contains, at present, a 40 H. P. Woodbury high speed engine especially designed for experimental work, a 15 H. P. vertical high speed engine, gauges, calorimeters, indicators, absorption brakes, sev-



Assay Laboratory

A Corner of the Forge Shop

eral sizes of platform scales, tachometers, and similar apparatus for the study of steam engineering. The shop engine is also fitted up for experimental work, and a threshing engine will be added during the coming year.

For the testing of materials there is a Riehle standard automatic and autographic screw power testing machine of 100,000 pounds capacity with auxiliary instruments, fitted up also for beam testing; an Olsen torsion testing machine capable of breaking a specimen 1½ in. by 5 ft.; and a Fairbanks' cement testing machine.

For electrical work the College owns two specially designed multipolar dynamos, each of 15 K. W. capacity at 125 volts. They can also develop 225 volts, and are arranged with commutator at one end and 6 collector rings at the other so as to give one, two, and three phase alternating currents. The two machines thus give a large number of combinations. Besides these there is a 6 K. W. bipolar dynamo and a good supply of voltmeters, ammeters, and wattmeters of the latest patterns. Some new dynamos will be added the coming year, besides transformers, recording wattmeters, etc., making the equipment complete and thoroughly up to modern standards.

For the study of steam boilers the 85 H. P. return tubular boiler in the shop building is available, and also the 25 H. P. boiler in the Experiment Station. Apparatus is provided for measuring feed water, fuel, and everything necessary for complete boiler tests.

Surveying Instruments.—In this line the College has two transits, one with solar attachment; two levels, a field compass, a plane table, a sextant, and chains, tapes, and rods of various kinds.

Water Measuring Instruments include three current meters, two automatic recording water registers, test weirs, and other auxiliary apparatus.

The Art Department has a good equipment of casts in busts, masks, parts of the human figure, ornament, and geometric solids; benches and tools for wood carving and clay modeling; photographic copies of sculptures and world pictures.

The Kitchen Laboratory is a large room provided with cupboards and conveniently furnished with tables, sinks, range, an Aladdin oven, and a good supply of cooking utensils of all kinds. Individual work tables are provided for the use of each student. These tables have a full equipment of cooking utensils.

Opening from the kitchen is a dining room with sideboard well supplied with table linen, dishes and silver.

The Sewing Room is furnished with a large cutting table, six small sewing tables, three sewing machines and a case for work.

The Biological Laboratory.—The apparatus of the Biological Department consists of the following instruments and materials: Seventeen compound microscopes of the Zeiss and Leitz patterns, one Zeiss dissecting microscope, fifteen Barnes' dissecting microscopes, numerous hand lenses, dissecting instruments, razors for hand sectioning, haemacytometer, automatic microtome, hand microtome, slide-ringer, wall charts, a fine set of models of parts of the human body and of the horse, cases, etc., for collecting plants and insects, paraffine bath, human skeleton, alcoholic fishes and crustacea, microscopic preparations for class use, collection of mollusca and insects, an herbarium of Montana flowering plants, dried specimens of mosses, lichens and parasitic fungi; reagents and stains for microscopic preparations.

For the year 1898-99 there has been added the apparatus necessary for bacteriological work, including steam and hot air sterilizers, an incubator, Wolfhuegel counting apparatus for water examination, and other accessories.

The green-house and conservatory on the Experimental farm furnish botanical material for use in the winter months, as well as specimens of such plants as grow naturally only in warmer climates than that of Montana.

SCHEDULE OF

THE GENERAL SCIENCE COURSE.

FRESHMAN YEAR.

[Figures indicate the number of recitations or the actual hours of practice per week.]

Fall Term.

Mathematics,	5:	Higher Algebra.
Language,	7:	Latin, or German, or French, 5. Rhetoric, 2.
History,	3:	Greek.
Chemistry,	3:	Lectures on the Non-Metals.
Practicums,	12:	Chemical Laboratory, 6. Art, 6.

Winter Term.

Mathematics,	5:	Higher Algebra, 3. Plane Trigonometry, 2.
Language,	7:	Latin, or German, or French, 5. Rhetoric, 2.
History,	3:	Roman.
Chemistry,	3:	Lectures on the Metals.
Practicums,	12:	Chemical Laboratory, 6. Art, 6.

Spring Term.

Mathematics,	5:	Plane Trigonometry.
Language,	7:	Latin, or German, or French, 5. Rhetoric, 2.
History,	3:	Mediæval.
Chemistry,	2:	Stoichiometry.
Practicums,	14:	Elementary Quantitative Analysis, 8. Art, 6.

GENERAL SCIENCE COURSE—SOPHOMORE YEAR.

Fall Term.

LANGUAGE,	6 or 7:	Latin, 4, or German, or French, 5. American Literature, 2.
HISTORY,	2:	Mediæval and Modern.
BIOLOGY,	5:	Botany, Lectures, 3. Zoology, Lectures, 2.
ELOCUTION,	1:	
Practicums,	10:	Mechanical Drawing, or Art, 4. Biological Laboratory, 6.
ELECTIVES,	5 or 8:	One of the following: Analytic Geometry, 5. Irrigation, 5. Domestic Science: Recitations, 2, Laboratory, 6.

Winter Term.

LANGUAGE,	6 or 7:	Latin, 4, or German, or French, 5. American Literature, 2.
HISTORY,	2:	Modern.
BIOLOGY,	5:	Botany, Lectures, 3. Zoology, Lectures, 2.
ELOCUTION,	1:	
Practicums,	10:	Bench Work in Wood, or Art, 4. Biological Laboratory, 6.
ELECTIVES,	5 to 8:	One or two of the following: Calculus, 5. Pedagogy, 5. Forestry, 2. Domestic Science: Recitations, 2, Laboratory, 6.

Spring Term.

LANGUAGE,	6 or 7:	Latin, 4, or German, or French, 5. Shakespeare, 2.
HISTORY,	2:	Modern.
ELOCUTION,	1:	
Biology,	5:	Botany, Lectures, 3. Zoology, Lectures, 2.
Practicums,	10:	Bench Work in Wood, or Art, 4. Biological Laboratory, 6.
Electives,	5 to 10:	One or two of the following: Calculus, 5. Organic Chemistry, Laboratory, 10. Horticulture, 5. Forestry, 2. Domestic Science: Recitations, 2, Laboratory, 5.

GENERAL SCIENCE COURSE--JUNIOR YEAR.

Fall Term.

Physics,	3:	General Properties, Mechanics and Heat.
Civics,	3:	Constitutional History.
Language,	2:	English Literature.
*Surveying,	2:	General Principles, Lectures.
Practicums,	10-14:	*Surveying, 6. †Wood Carving, 10. Physical Measurements, 4.
Electives,	5 to 8:	One or two of the following: Book-keeping, 5. Irrigation, 5. Physiological Botany: Lectures, 2, Laboratory, 6. Astronomy, 3. Differential Equations, 2.

Winter Term.

Physics,	3:	Electricity and Magnetism.
Language,	2:	English Literature.
Logic,	4:	Elements of Logic.
Civics,	3:	Constitutional Law.
Biology,	7:	Bacteriology, 2. Human Physiology, 5.
Practicums,	8:	Physical Measurements, 4. Bacteriology, 4.

Spring Term.

Physics,	3:	Sound and Light.
Language,	2:	English Literature.
Economics,	5:	Principles of Political Economy.
Practicums,	4:	Physical Measurements.
Electives,	8 to 13:	Two of the following: Recitations: History of Philosophy, 5. Human Physiology, 5. Landscape Gardening, 3. Laboratory: Chemical Analysis, 10.

---

*Required of Men. †Required of Women.

GENERAL SCIENCE COURSE—SENIOR YEAR.

Fall Term.

Geology,	5:	Dynamical and Structural.
Philosophy,	5:	Psychology.
Practicums,	10:	Mineralogy and Crystallography.
Electives,	2 to 12:	One or two of the following:
		Recitations:
		English Literature, 2.
		Laboratory:
		Advanced Physical Measurements, 10.

Winter Term.

Geology,	5:	Historical.
Political Science,	5:	International Law.
Social Science,	5:	Sociology.
Electives,	5 to 15:	One or two of the following:
		Recitations:
		Psychology, 5.
		English Literature, 2.
		Laboratory:
		Biology, 10.
		Advanced Physical Measurements, 10.

Spring Term.

Geology,	3:	Economic.
Moral Science,	5:	Principles of Ethics.
Thesis.		
Electives,	5 to 15:	One or two of the following:
		Recitations:
		Psychology, 5.
		English Literature, 2.
		Laboratory:
		Biology, 10.
		Advanced Physical Measurements, 10.

THE GENERAL SCIENCE COURSE.

This course may be considered as representing the general educational work of the College. It is arranged so as to meet the wants of those who seek to obtain a liberal and practical education through the study of the Mathematical, Physical, Natural and Economic sciences, and Latin or the Modern Languages and Literature. It provides a thorough training in Mathematics and Physics and in the natural sciences, Biology, Chemistry, Botany, Geology; also in the study of Mental, Moral and Political Science. It includes a liberal course in History, the English Language and Literature. The design is that any student completing the course shall be thoroughly equipped for the duties of life and fitted to enter successfully upon any chosen career.

ENGLISH.

PROF. BREWER.

1. ***Rhetoric.***—This work is a further application of the principles learned in the Preparatory course. A little time is spent in the development of theory, but for the most part the course consists in actual practice in the different types of English prose composition, exposition, argumentation, description, and narration. Themes are prepared frequently and read and criticised before the class. Models are set from the English masterpieces for imitation. Work poorly done is rewritten by the student, in accordance with the suggestions of the instructor. The course is intended to form a sufficient preparation for the written work required frequently in most subjects throughout the course.

2. ***American Literature.***—The first formal literary course in the College is the study of American Literature, which takes two hours a week during the fall and winter terms of the Sophomore year. No textbook is used, the work being altogether lectures, with outside reading, and written and oral reports. The library is fairly well equipped with the necessary material, which is constantly being increased.

3. ***Shakespeare.***—The spring term of the Sophomore year is devoted to Shakespeare, at least one play being read critically in class. All students are expected to be able to read aloud intelligently and intelligibly, and such reading is considered a part of the interpretation. Lectures and written reports form a part of the work.

4. ***English Literature.***—In the Junior year the subject of the course is some period of English literature since Shakespeare. The methods of work are the same as in the course in American literature described above. The period treated will vary from year to year to furnish an elective course for the Seniors.

In the Senior year the work is similar in character to the work already described in the Junior year. The subject of the course will be changed from year to year, and the Seniors will recite with the Juniors.

HISTORY.

PROF. BREWER.

1. ***Greek and Roman.***—In the Freshman year a two-years' course in General History is begun. During the first year the history of Greece and Rome forms the main subject. A textbook is used, supplemented so far as is practicable by library references. Particular emphasis is placed upon the literary history, as this is the only opportunity that many

of the students have of becoming acquainted with the matter of two great literatures. In the spring term the study of the migration of the Teutonic tribes, and the preparations for the organization of the new kingdoms prepares the way for the second year's work.

2. ***Mediæval and Modern.***—In the Sophomore year the work begins with a further study of the mediæval period, the chief emphasis being placed upon English and Continental history. The course brings the history of the more important countries down to our own time.

3. ***Constitutional History.***—The fall term of the Junior year is given to the study of the English constitution and its history. The knowledge acquired in the earlier historical courses furnishes much material for comparison. The course is a valuable though not a necessary introduction to the study in the winter term of the American constitution in its history, its theory, and its actual working. Both these courses consist mainly of reading and reports with occasional lectures.

LATIN.

PROF. BREWER.

1. ***Virgil.***—The study here is comparative so far as the proficiency of the students allows, the different great epics being taken up together with the Aeneid. Metrical reading of the Latin is practiced constantly. Occasional written translations in prose are required, and the students are encouraged to attempt metrical translations and paraphrases.

2. ***Cicero.***—The four orations against Catiline are read, and three others. Work in prose composition is required during a part of this time. Roman politics, as compared

with those of our own day, always interest students who have an intelligent interest in current events, and there is every opportunity for such comparative study in this course.

MODERN LANGUAGES.

PROF. CURRIER.

FRENCH.

FRESHMAN YEAR.—The work includes thorough study of the elements of grammar, careful reading with translation of three hundred pages or more of easy French, composition, and practice in pronunciation and oral reading. The main object is to acquire facility in sight reading. Text books used are: Edgren's French Grammar, Super's French Reader, and easy texts.

SOPHOMORE YEAR.—Study of grammar and composition continued, with special reference to idioms and syntax. Practice in hearing and speaking French will be afforded. In addition to easy prose, specimens of the classics, prose and poetry, will be read, and important facts in the history of French literature studied. Besides cultivating a taste for and appreciation of foreign literature, the aim of the course is, by extensive and varied reading, to furnish the student a vocabulary and command of idioms, which may be of practical service in the future.

GERMAN.

FRESHMAN YEAR.—This year's work will comprise thorough study of the elements of grammar, careful reading with translation of at least two hundred pages of easy German, composition, and to a limited extent conversation, based upon the text read. The prime object will be to lay a solid foundation for practical sight reading. Essentials of pronunciation will not be neglected. Text books used are:

Harris' German Lessons, Thomas' German Grammar, Harris' German Reader, and easy texts.

SOPHOMORE YEAR.—Study of grammar and composition will be continued with special reference to idioms and syntax. As far as practicable, German will be the language of the class room. Following easy prose, some of the German classics, both prose and poetry, will be read, with or without translation, and the more important facts in the history of the literature will be studied. Aside from the training of taste and literary culture, the chief aim throughout the entire course is, by extensive and varied reading, to insure to the student a command of vocabulary and idioms, which may be of practical service in the future.

MATHEMATICS.

1. ***Higher Algebra.***—Beginning with a thorough review of radicals, quadratics, ratio and proportion, the course covers variation and progression, binomial theorem, convergency, divergency, and summation of series, undetermined coefficients, logarithms, permutations and combinations, and continued fractions. Text-book: Wells' College Algebra. MISS TRAVIS.

2. ***Trigonometry.***—A thorough course in plane trigonometry, much time being given to the solution of triangles on account of its great practical importance in further technical work. Text-book: Wells' New Plane Trigonometry. MISS TRAVIS.

3. ***Analytic Geometry.***—Straight lines and conic sections, and an introduction to geometry of three dimensions. Text-book: Nichols' Analytic Geometry. PROF. WILLIAMS.

4. ***Calculus.***—The work will be made as practical and concrete as possible. The integral calculus will be intro-

duced early in the course and taught consecutively with the differential. Text-book: Hall's Calculus.

PROF. WILLIAMS.

5. ***Differential Equations.***—A short course supplementary to the Calculus. Text-book: Osborn's Differential Equations. PROF. WILLIAMS.

CHEMISTRY AND PHYSICS.

DR. TRAPHAGEN AND MR. COBLEIGH.

(For description of sub-courses, see Course in Chemistry.)

1, 2. ***General Chemistry.***—Lectures and laboratory work.
3. ***Qualitative Analysis.***
4. ***Stoichiometry.***
5. ***Elementary Quantitative Analysis.***
7. ***Organic Chemistry.***
10. ***Chemical Analysis.***

Physics. The lectures in physics are designed to render the student familiar with the modern theories. The work is largely experimental, the fine set of physical apparatus made for us by Max Kohl of Chemnitz, Germany, making it possible to illustrate by attractive experiments many of the phenomena of this science.

Physical Measurements.—This work is that outlined in Sabine's Manual of Physical Measurements and consists of a series of very carefully selected experiments in physics. It constitutes course C of Harvard University.

ART.

MRS. MARSHALL.

The Art Course, as outlined, will indicate the work of the average student. All the art teaching being individual, the student is carried forward just as rapidly as his own talent and industry will permit.

Every effort is made to teach correct drawing. The pupil is then encouraged to apply such knowledge in any direction in which his talents may seem to lie, and is allowed the use of various mediums such as oil, water-color, pastel, etc., and also can take lessons in China painting.

The classes in drawing and wood-carving are open to students in any of the College courses.

All the work done must be returned for the annual Art Exhibition.

FRESHMAN YEAR.

Drawing from the cast, in charcoal and crayon. Still life and object drawing. Drawing from plants and other natural forms in preparation for design. Sketching from nature, during the last few weeks of the spring term.

In object drawing the pupil is required to study artistic grouping and good arrangement of light and shade. Memory and time drawing and blackboard work will be carried through the year.

Perspective, and its practical application to the drawing of buildings and to sketching from nature. Perspective problems to be worked out and carefully drawn. Water-color tinting for Mechanical work.

Two art lectures a week.

Clay modeling and wood-carving may be studied at the discretion of the teacher.

SOPHOMORE YEAR.

General Principles of Design.—Color schemes and color harmony. Historic ornament.

Each student will occasionally be required to submit original designs for embroidery, wood-carving and other decorative work, based upon plant forms which he has drawn during previous years.

Painting of plants and still life in oil or water-color.

Pen and ink drawing.

Sketching from nature as the weather will permit.

JUNIOR YEAR.

An extended course in wood-carving; carving as applied to furniture and other objects.

Lectures on the history of wood carving.

Additional courses in Art Work will be found under the Home Science Course.

BIOLOGY.

It is the purpose, through the courses offered in Biology, to afford not only a sufficient amount of general training in subjects involved to enable the students to conduct independent investigations, but also by means of electives to give such a training in the practical problems of Biology that the graduates from the department may be fitted to take positions as teachers or expert workers in the subjects elected. An outline of the courses at present offered in Biology is presented below.

BOTANY AND BACTERIOLOGY.

Dr. Jennings.

1. ***Special Morphology of the Cryptogams.***—Schemes of classification. Methods of reproduction. Mechanisms of fertilization. Vegetable parasitism. Habits, physiology and culture of fungi. Plant embryology.

2. ***Anatomy and Development of Phanerogams.***—Cellular structure and relationships of flowering plants. Nature and structure of protoplasm and its various modifications and

products as cell-contents. Examination of starches, proteids, crystals, alkaloids, etc., in plant cells. Microchemistry.

3. ***Physiological Botany.***—Nutrition, growth and movements of plants. Influence of external conditions on form, structure and function.

4. ***Economic Botany.***—Economic uses of plant products. Foods and adulterants, drugs, textile fibers. Examination and recognition of plant tissues and products by microscopical and microchemical methods.

5. ***Plant Pathology.***—Diseases of plants. Biology and methods of distribution of fungi. Effects of parasitism upon the parasite and upon the host. Control of plant diseases and the application of fungicides.

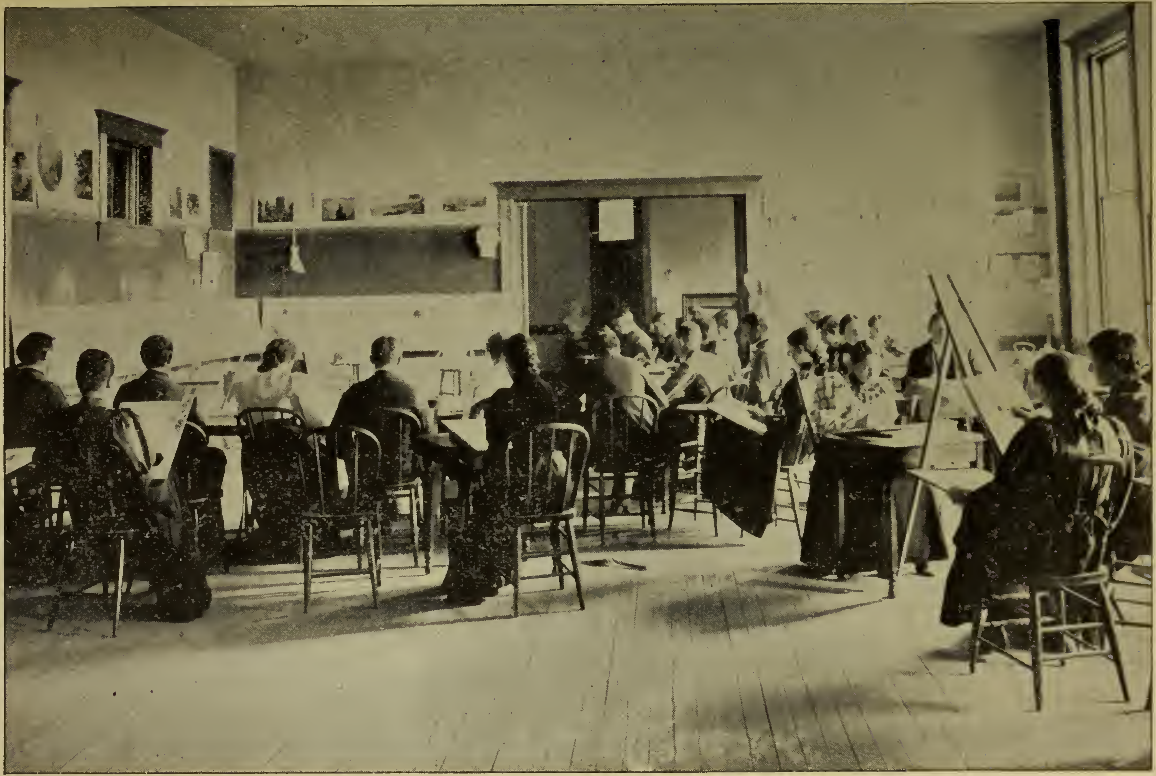
6. ***General Bacteriology.***—Classification and habits of growth. The bacteria which produce fermentation, decomposition, color, phosphorescence and disease. Relation of bacteria to household and general sanitation. The beneficial action of bacteria. Germ theory of disease. Contagious diseases, and natural and artificial immunity. Vaccination and serum treatment. Antiseptics and bacteria in medicine and surgery. Bacteria in foods, water, air and soil. Sterilization and disinfection. Plate, cell and test-tube culture.

7. ***Research Work*** upon some topic of experimental physiology, anatomy, or classification of plants, either cryptogamic or phanerogamic.

ZOOLOGY.

Dr. Wilcox.

1. ***General Structural and Developmental Zoology.***—Special morphology of the various groups of lower animals up



ART ROOM

to Vermes. Relationship of animal orders one to another. Special and general anatomy and development. Dissections and microscopic examination.

2. **Comparative Anatomy and Embryology** of the higher forms of animals. Special morphology of Vertebrates, with dissection of a fish, reptile, bird and mammal. Animal histology. The geographical distribution of animals, and paleontology. The meaning of species, evolution, development of the individual and of the race. Protective coloration and resemblance. Habits and instincts.

3. **Entomology.**—The anatomy, metamorphosis, classification and geographical distribution of insects. Collecting, rearing and preserving of insects. Study of their life history and habits. Economic entomology. Insect depredations. Natural and artificial remedies. Animal parasitism.

4. **Embryology.**—Lectures and laboratory work on the development of the chicken. Killing, preserving and staining methods in animal histology. Microtome sectioning. Drawing with camera lucida, and microscopic technique.

5. **Research Work** throughout the Senior year upon some topic in the histology, development, or physiology of animals.

Human Physiology.—Normal and pathological action of organs. Effects of various foods and methods of living upon the health. General hygiene and prevention of disease. Causes of special and general diseases. Preventive medicine and treatment of disease. DR. WILCOX.

Horticulture.—Elective, five periods per week in spring term, Sophomore year. General scheme: selection and preparation of site for orchard and small fruits, propagation of trees and plants, comprising production of fruit stocks, grafting, budding, layering, etc.; planting, cultivating, pruning, winter protection, irrigation, harvesting, storing and marketing fruit. The treatment of trees and plants for fungous diseases and parasites. DIRECTOR EMERY.

Landscape Gardening.—Elective, three periods per week in spring term, Junior year. Will embrace landscape and kitchen gardening by lectures, also by illustrations drawn from object lessons upon the Experiment Station and College grounds, of trees, plants and flowering shrubs, the method of propagating these, general arrangement, planting and culture, also practical instruction in vegetable and window gardening.

Upon the grounds of the Experiment Station, in connection with the College, is a small but practical nursery; also an orchard in which are propagated and cultivated the various small orchard fruits, deciduous and evergreen trees, vines, etc. The greenhouse and conservatory afford excellent opportunity to acquire a good working knowledge of the science of Horticulture, than which there is no agricultural science of more value to mankind. DIRECTOR EMERY.

Forestry.—This subject will be given in a course of lectures and in frequent excursions to the adjacent mountains. It will include a brief history of forestry in this and other countries, the planting of forests, their preservation and treatment, their relation to the waterflow, climate and hygiene; the causes of forest devastation and methods of prevention.. The student will be taught the different conditions governing tree growth and the relative value of the timber trees in this State.

Students will be furnished with public documents on this subject by the Forestry Division in the United States Agricultural Department at Washington, as well as with the publications by the various Forestry Associations. The course will be conducted from a practical standpoint, and will keep in view at the same time the conditions of the forests of Montana. CAPTAIN AHERN.

GEOLOGY.

DR, TRAPHAGEN.

Lectures in connection with the use of Le Conte's Elements of Geology, as a text, occupy the entire year. The work is divided into Physical, Structural and Historical Geology, and includes practice in the indentification of the age of rocks by fossils, stratigraphical work in the field, and identification of the crystalline rocks by microscopical examination.

The fact that the Livingston and Three Forks folios, just issued by the United States Geological Survey, cover the region immediately surrounding us, shows how favorably we are situated for field work in geology under the best conditions.

We have within a few miles of the College, not only stratified rocks covering great ranges of geological time, but we have also many of the eruptives, which have been carefully studied and described by expert geologists.

Economic Geology is treated by lectures under the following general headings:

1. Ore Deposits; Classification, Genesis, Occurrence.
2. Coals, Petroleum and Natural Gas.
3. Building Stone.
4. Abrasive Materials.
5. Natural Salts.
6. Gems.
7. Limes, Cement and Artificial Stones.
8. Pigments.
9. Water.
10. Phosphates.
11. Clays used for Pottery, Porcelain, etc.
12. Sands for Glass.
13. Soils.
14. Miscellaneous Topics.

Mineralogy.—Lectures upon Mineralogy are given and the attention of the student is directed to the characteristics of each of the minerals whose identification is required, its resemblance to other minerals and its differences. These lectures deal with all those properties which can be distinguished without apparatus, the chemical composition and tests being only incidentally treated. Later, in Determinative Mineralogy, unknown minerals are given, and by the application of the chemical tests of blowpipe analysis, and his knowledge of Theoretical Mineralogy and of Crystallography, the student identifies the specimens.

The specimens used in this course consist of a large collection, illustrating the minerals of economic importance and their associates. The students also have access to the very extensive collections of the College.

Crystallography.—Crystallography is taught by aid of a set of models which illustrate the more important crystalline forms and their modifications. They cover all the forms of which a knowledge is necessary for the student of Mineralogy, and the student becomes thoroughly familiar with each of them.

MENTAL AND MORAL SCIENCE.

PRES. REID.

The work in this department aims to introduce the student to an acquaintance with the nomenclature, definitions, methods, problems and aims of philosophical study. The transition by the young student from studies mainly objective, to studies chiefly reflective and subjective, is often to the average student, a difficult and unwelcome experience. Any course of preliminary instruction, therefore, calculated to smooth the way for this transition by familiarizing the student's thought with the terms, definitions, method and easier problems, must be as valuable as welcome to the student. Suitable elementary texts in Logic, Psychology and Ethics will be chosen to perform this important office, supplemented by a course of lectures especially prepared as an introduction to a more comprehensive study of Philosophy. The History of Philosophy will be studied during the spring term of the Junior year.

Logic.—The work in this subject will occupy the winter term of the Junior year. Of the value of the study of Logic, both as a mental gymnastic and as a special training of the faculties for the discovery of truth and the detection of error, nothing need be urged.

Our method of instruction includes thorough study of the text book and a practical application of the principles of Logic to the student's habits of thinking and expression, and to the detection of logical fallacies in examples chosen from standard literature.

Psychology.—The fall term of the Senior year is devoted to this study. Careful attention will be given to the double aspect of this science, approaching it from the standpoints of consciousness and physiology. Class discussion and debate on the many interesting and practical questions that constantly present themselves in pursuing this study will be encouraged, and thesis work assigned to develop such questions more fully. The study may be carried on as an elective throughout the year.

Economics and Sociology.—The principles of Political Economy are taken up in the spring term of the Junior year and consists of a course in general economic theory based upon Ely and Walker. The subjects of Money and Banking, Taxation, Rent, Socialism and the Labor Problem are discussed.

The work in Sociology is carried on during the winter term of the Senior year. The origin and history of human society, the various social phenomena, and the laws controlling human intercourse will be treated.

The general theory of Sociology is taken up and studied by means of text book and discussions.

Ethics.—During the last term of the Senior year the study of Ethics is taken up and is carried on daily throughout the term. The various ethical theories are discussed, for which the student is prepared by his studies in the History of Philosophy and Psychology.

Astronomy.—This study is elective in the fall term of the Junior year, and includes the study of the celestial sphere, astronomical instruments, the solar system, eclipses, the stars, etc.

Mechanical Drawing.—The use of instruments, elementary projections, free-hand sketching of objects from which complete drawings are made. PROF. WILLIAMS.

Shop Work.—The use and care of tools, exercises on the most common splices and joints, rabbeting, gaining, and plowing. Each new exercise will be preceded by lectures. The course is designed to give students such training in the use of tools as will be of most value to them in their future work. PROF. WILLIAMS.

Irrigation.—Students in the General Science Course are offered the same work in Irrigation as is required of Agricultural students. PROF. ———

Surveying.—Only the elements of plane surveying are taught, including the use of the compass, transit, level, chain and rods; all adjustments of instruments; surveying of fields, establishing of corners, running of levels, triangulation, computation of areas and earthwork. Class room and field work. PROF. ———

Elocution.—In the Sophomore year all students in regular courses are required to take Elocution one hour per week. This course will be theoretical as well as practical, and a textbook will be used. PROF. CURRIER.

Book-keeping.—The Tablet System is used, and embraces the keeping of books in Jobbing, Wholesale Wood and Coal, Flour, and Hay and Grain by Double Entry, and Retail Lumber by Single Entry. The student is required to use all kinds of business papers, such as checks, notes, drafts, bills, etc., becoming very familiar with the vouchers used in actual business.

The course gives the student sufficient knowledge of accounts to enable him to keep a simple set of books and to do business in a business-like manner. PROF. PHELPS.

Domestic Science.—Students taking Domestic Science in the Sophomore year of the General Science Course have a choice of cooking or sewing. The work in cooking is both theoretical and practical. The sewing includes both hand and machine work, dressmaking and embroidery.

MISS HARKINS.

Pedagogy.—The work in this subject is elective, five hours per week during the Sophomore year. The work of this course includes a study of the prominent educators, and discussions of the principles advocated by them as related to the modern methods of education. MISS CANTWELL.

◆

SCHEDULE OF

AGRICULTURAL COURSE.

FRESHMAN YEAR.

[Figures indicate the number of recitations or the actual hours of practice per week.]

Fall Term.

Mathematics,	5:	Higher Algebra.
Language,	2:	Rhetoric.
History,	3:	Greek.
Agriculture	5:	Breeds and Breeding.
Chemistry,	3:	Lectures on the Non-Metals.
Practicums,	12:	Chemical Laboratory, 6. Drawing: Sketching and Lettering, 6.

Winter Term.

Mathematics,	5:	Higher Algebra, 3. Plane Trigonometry, 2.
Language,	2:	Rhetoric.
History,	3:	Roman.
Agriculture,	3:	Rural Economy.
Chemistry,	3:	Lectures on the Metals.
Practicums,	16:	Chemical Laboratory, 6. Shops, Carpentry, 10.

Spring Term.

Mathematics,	5:	Plane Trigonometry.
Language,	2:	Rhetoric.
History,	3:	Mediæval.
Chemistry,	2:	Stoichiometry.
Practicums,	24:	Organic Chemistry, 10. Elementary Quantitative Analysis, 8. Architectural Drawing, 6.

AGRICULTURAL COURSE—SOPHOMORE YEAR.

Fall Term.

Language,	2:	American Literature.
History,	2:	Mediæval and Modern.
Agriculture,	5:	Soils, Crops and Manures.
Biology,	5:	Botany, Lectures, 3. Zoology, Lectures, 2.
Surveying,	2:	General Principles, Lectures.
Elocution,	1:	
Practicums,	12:	Biological Laboratory, 6. Surveying, 6.

Winter Term.

Language,	2:	American Literature.
History,	2:	Modern.
Biology,	10:	Human Physiology, 5. Botany, Lectures, 3. Zoology, Lectures, 2.
Elocution,	1:	
Practicums,	14:	Biological Laboratory, 6. Shops: Forge Work, 8.

Spring Term.

Language,	2:	Shakespeare,
History,	2:	Modern.
Agriculture,	3:	Agricultural Engineering.
Horticulture,	5:	
Biology,	5:	Botany, Lectures, 3. Zoology, Lectures, 2.
Elocution,	1:	
Practicums,	10:	Agricultural Engineering, 4. Biological Laboratory, 6.

AGRICULTURAL COURSE—JUNIOR YEAR.

Fall Term.

Language,	2:	English Literature.
Physics,	3:	General Properties, Mechanics and Heat.
Civics,	3:	Constitutional History.
Agriculture,	8:	Feeding of Animals, 5.
		Dairying, 2.
		Forage Plants, 1.
Practicums,	14:	Physical Measurements, 4.
		Dairying, 10.
Electives,	3 or 5:	One of the following:
		Astronomy, 3.
		Book-keeping, 5.

Winter Term.

Language,	2:	English Literature.
Physics,	3:	Electricity and Magnetism.
Agriculture,	3:	Agricultural Chemistry and Physics.
Biology,	7:	Anatomy of the Domestic Animals, 5.
		Bacteriology, 2.
Practicums,	8:	Physical Measurements, 4.
		Bacteriology, 4.
Electives,	2 or 4:	One of the following:
		Logic, 4.
		Forestry, 2.

Spring Term.

Language,	2:	English Literature.
Physics,	3:	Sound and Light.
Biology,	11:	Veterinary Medicines, 3.
		Economic Entomology, 5.
		Embryology, 3.
Practicums,	14:	Entomology, 4.
		Quantitative Analysis, 10.
Electives,	2 or 5:	Economics, 5.
		Forestry, 2.

AGRICULTURAL COURSE—SENIOR YEAR.

Fall Term.

PHILOSOPHY,	5:	Psychology.
AGRICULTURE,	3:	Irrigation.
GEOLOGY,	5:	Dynamical and Structural.
BIOLOGY,	3:	Animal Nutrition.
Practicum,	4:	Irrigation.
ELECTIVES,	10:	One of the following: Biology, 10. Chemistry, 10.

Winter Term.

SOCIAL SCIENCE,	5:	Sociology.
BIOLOGY,	3:	Diseases of Animals.
GEOLOGY,	5:	Historical.
MECHANICS,	2:	The Steam Engine.
Practicum,	6:	Mechanical Laboratory.
ELECTIVES,	10:	One of the following: Biology, 10. Chemistry, 10.

Spring Term.

MORAL SCIENCE,	5:	Ethics.
HORTICULTURE	3:	Landscape Gardening.
AGRICULTURE,	5:	History of Agriculture.
GEOLOGY,	3:	Economic.
BIOLOGY,	3:	Plant Pathology.
THESIS.		
ELECTIVES,	10:	One of the following: Biology, 10. Chemistry, 10.

THE COURSE IN AGRICULTURE.

The aim of this course is to give young men a general scientific education, to thoroughly instruct them in the relations of science to the various branches of Agriculture, and to supply the mental training necessary to successful investigators or practical agriculturists.

The student is taught the application of the principal branches of physical and natural science to the business of farming, and is afforded a thorough knowledge of its principles and practices. Instruction is given in regard to the nature of soils, the reason for, and the best methods of cultivation; the application of water to growing vegetation, and the action of irrigation waters upon the soil and crop; the constituents and characteristics of plants and animals, and the conditions necessary for their perfect development.

The student's time is not consumed in manual labor, except where special skill is required in the performance of some particular work. His time is fully occupied in the instruction in class room, laboratory, field and shop. No pains are spared to give a high degree of intellectual training and special preparation for the business of farming.

The general studies of the course include Mathematics, English, History, Literature, and the principles of the general sciences. The direct application of these sciences is brought out early in the course, and as the student advances in mental training he is given more difficult work. During the Senior year he is assigned subjects for original investigation. For a description of these studies see the General Science Course.

The special or technical studies are as follows:

Soils, Crops and Manures.—Kinds of soils, their source, physical properties, cultivation. History of our common crops, their development, production, uses, characteristics. Action of manures; potash, nitrogen and phosphorus; their adaptability to general and special crops; green manuring, artificial manures, maintenance of fertility of soils.

Rural Economy.—Selection of a farm; kinds of farming, general, special, extensive; dairying, stock raising, cattle and sheep ranching, grain farming—elements of success in each; farming as a business, and its relation to other vocations; the farmer as a producer, manufacturer, merchant, and consumer.

Agricultural Engineering.—Farm buildings, kinds and their adaptation to general and special needs; their construction, farm fences, roads; location of buildings with reference to kind of farming practiced; farm machinery, kinds and adaptability of implements; application of different sorts of power to farm purposes.

Dairy Husbandry.—Adaptability to certain sections; small dairies and creameries; testing of milk; butter and cheese making; breeds of dairy animals; rearing, feeding and management.

Breeds and Breeding.—Different breeds of live stock, their source, breeding and development; pedigrees, their value and manner of keeping; principles of stock breeding, atavism, heredity, selection, control of sex, inbreeding, linebreeding, crossing, parental and climatic influences; care and management of breeding animals.

Feeding of Animals.—Constituents of foods, and of the animal body, their relation to each other; digestion, assimilation and waste; feeding stuffs, varieties, preparation, by-products, composition, digestibility, nutritive ratios; harvesting of fodders, hay making, ensilage, roots; soaking and grinding of food; feeding for special purposes, calculation of ratios; feeding standards, maintenance ration; feeding for beef, mutton, pork; feeding the working animal;

feeding for milk and butter, for muscle power; effects of breeds; individuality of animals; influence of various foods.

Irrigation.—This subject is of special importance and great value in the Rocky Mountain regions, where successful agriculture depends upon the application of water to crops by artificial means.

The object is to give students a thorough knowledge of the irrigation laws of Montana, construction and maintenance of ditches, headgates, measuring devices, inch and cubic foot systems of measurement.

Action of water on soils and crops; irrigation appliances and devices; measurement, division and duty of water; method of application to various soils, drainage, seepage from ditches; amount of water returning to rivers which may be again used in irrigation; formation of ditch companies and their methods of management.

Surveying.—The elements of this science are taught, which includes the theory of surveying, the use of the compass, transit, level, chain and rods; all adjustments of instruments; surveying of fields, location of corners, triangulation, computation of areas, earthwork, etc., and laying out of ditches.

VETERINARY SCIENCE.

1. ***Anatomy of the Domestic Animals,*** both special and comparative. Laboratory work will consist of dissections of the various domesticated animals.

2. ***Veterinary Medicines.*** Nature, uses, effects, doses, and applications of the various drugs used in veterinary practice. General preventive measures and animal sanitation. Care and use of domestic animals.

3. ***Animal Nutrition.***—Value, uses and effects of the common fodder plants. Comparative animal physiology. Functions of the various organs in the digestion of foods. Assimilation and excretion. Diseases of animals. Special,

general and contagious diseases of animals. Pathological physiology and anatomy of organs. Diagnosis, surgical and medical treatment of diseases.

Agricultural Bacteriology.—The bacteria of soils and water. Bacteria of manure, and of the tubercles of leguminous plants. Laboratory work in pure culture of bacteria.

Bacteria of the Dairy.—Their action in the souring of milk, ripening of cream, and in the manufucture of cheese.

Agricultural Chemistry and Physics.—Lectures upon the origin, composition, and physical properties of soils and the conservation of plant food and moisture. The composition of animal and vegetable tissues and principles of nutrition. Manufacture and use of fertilizers, etc.

Chemistry.—The course in Chemistry contains a description of the work in general chemistry, laboratory work and organic chemistry.

Shop Work.—CARPENTRY.—Use and care of tools, exercises on the most common splices and joints, framing of timber structures. Each student will be expected to frame and put together a miniature building of moderate complexity. The shop exercises will be preceded by lectures.

FORGE WORK.—Bending, upsetting and welding; abundant exercises in a large variety of the most common and simple forms of forgings. Annealing and tempering of steel; methods of sharpening steel tools; construction of punches, drills, chisels, etc.

Drawing.—The use of instruments, elementary projections, free-hand sketching and lettering, elementary perspective and architectural drawing.

Steam Engines and Boilers.—A brief course in the theory, design and management of steam engines and boilers. The time will be largely devoted to the slide valve engine and the locomotive type of boiler. The class room work will be supplemented by work in the Mechanical Laboratory.

Forestry.—The same work as described under General Science Course.

Thesis.—During the last term of the Senior year the students are required to select subjects for graduation theses. The subjects selected will be in the line of their chosen work.

SHORT COURSE IN AGRICULTURE.

Besides the regular four year course, the College provides a Short Course in Agriculture, extending over two years, and beginning the first Monday in January and lasting thirteen weeks.

This Course is designed to meet the wants of those interested in farming operations who feel that they have not the time to spend in taking a four years' course, but still wish to better fit themselves for the business of farming.

The work has been planned to give the largest amount of information and assistance possible. The subjects taught are those of which every farmer should have a full and clear knowledge, and are presented in a manner to make the information helpful in the highest degree.

The Short Course, coming as it does in the winter, when the work on the farm is at a minimum, presents the best opportunity for the farmer to avail himself of the instruction given.

In the establishment of this course it was the desire of the Board and Faculty to present a comprehensive scheme of study that would be as inexpensive as possible. The student is required to pay a general fee of $5.00 a term, and fees covering the cost of materials used.

He has the free use of the College library containing 3,300 carefully selected volumes and 2,000 pamphlets, be-

Chemical Laboratory

Experiment Station Laboratory

sides the best agricultural papers published, choice magazines and daily and weekly newspapers.

Lectures treating of the following subjects will be given:

Breeds and Breeding.
Agricultural Engineering.
Farm Dairying.
Rural Economy.
Animal Diseases.
Practical Steam Engineering.
Cultivation of Farm Crops.
Feeds and Feeding.
Horticulture.
Economic Entomology.
Veterinary Medicines.
Shop Practice: Forge Work, Carpentry.

The student may select those subjects which he believes will best suit his wants. It is required that he take at least three of the subjects taught. The outlines of the courses are as follows:

PRACTICAL MECHANICS.

PROF. W. H. WILLIAMS.

Carpentry.—Use and care of tools; exercises on the most common splices and joints; framing of timber structures. Each student is expected to frame and put together a miniature building of moderate complexity.

The shop exercises will be preceded by lectures in which the strength and theory of the various frames and splices will be discussed.

Forge Work.—This consists of the simple operations of the blacksmith, in which the student will gain sufficient knowledge, if conscientiously pursued, to do all the ordinary blacksmithing on the farm.

The work consists of bending, upsetting, and welding, with abundant exercises in a large variety of the most common and simple forms of forgings. Annealing and tempering of steel; methods of sharpening steel tools; construction of punches, drills, chisels, etc. The student is required to spend three hours daily in the shops at forge or bench.

Practical Steam Engineering.—The construction, care and uses of small engines and boilers, especially of the portable and traction style. Care of pumps and injectors used therewith, and how to set valves.

An elementary text-book will be used to give students a fair knowledge of fundamental principles. For the practical work, the threshing engine and 15 H. P. vertical engine in the Engineering Laboratory will be used. The course is designed to teach the student to intelligently operate engines and boilers of this class.

AGRICULTURE.

Prof. Robt. S. Shaw.

Rural Economy and Agricultural Engineering.—The selection and location of a farm; kinds of farming—general, special, extensive, dairying, stock raising, cattle and sheep ranching and grain farming. The elements of success in each; farming as a business, and its relation to other vocations. The farmer as a producer, manufacturer, merchant and consumer.

The construction of farm buildings, varieties and adaptation to general and special needs. Farm fences and roads; location of buildings with reference to utility; kinds and adaptability of implements; application of different kinds of power to farm uses.

Farm Dairying.—These lectures treat of the adaptability of this branch of farming to certain localities; small dairies and creameries; butter and cheese making, testing of milk; the use of the lactometer and the Babcock milk test. Breeds of dairy animals; rearing, feeding, and management of dairy cows.

Cultivation of Farm Crops.—This subject deals with the preparation of land for crops; plowing, harrowing, seeding, irrigating and harvesting; various methods used and their action upon soil and crop; rotation and fertilization of crops; summer fallowing; preservation and maintenance of fertility; manufacture and use of fertilizers; composition and physical properties of the soil; conservation of moisture and plant food; the atmosphere as a source of plant food; action of frost, wind, and climate on crops.

Breeds and Breeding.—The subjects of Breeds of Live Stock treats of the characteristics of each breed, their origin and adaptability to various conditions in the country from which they originated. Comparison is made of these conditions with those present in Montana, and the breeds best adapted to our climate, range and market are indicated. An insight is given into the methods of registering stock, thus leading to a knowledge of the use of the herd book and the value of pedigree.

The care of breeding animals; practices, principles and methods of breeding, including atavism, heredity, selection, control of sex, in-breeding, crossing; parental and climatic influences with special reference to conditions present in Montana.

Feeds and Feeding.—This subject deals with the constituents of foods and their relation to the animal body. Various feeding standards; nutritive ratio; feeding stuffs; preparation and harvesting of roots, fodders, etc. Feeding for beef, mutton, pork, milk, work, and a maintenance ration. The effect of food upon the various breeds, and the influence of the individuality of animals. The object of this work is to aid the student in becoming a practical and intelligent feeder. He is given an opportunity to see the principles taught in the class room practically applied in the feeding of the various animals under experiment on the Experiment Station.

HORTICULTURE.

DIRECTOR S. M. EMERY.

FIRST YEAR:—Instruction in Horticulture will be given by lectures, laboratory practice and field work.

Special attention will be given to the various methods of propagation: by seeds, cuttings, layers, buds and grafts. Selection of sites for orchards and small fruit plantations, with reference to suitable exposure, character of soil, etc., will receive careful consideration; also the preparation of soil, its proper fertilization and the rotation of crops thereon, pruning and irrigation.

Winter protection for trees and plants will be a specialty. Instruction will be given in commercial marketing of fruits, assorting and packing, also the construction of fruit packages.

Kitchen Gardening will embrace the selection and adaptation of varieties of vegetables, and esculent roots to the various sections of Montana; the construction and operation of green houses, hot-beds, cold frames and forcing houses; seed testing, methods of planting and cultivation, the winter care of vegetables, etc.

SECOND YEAR:—LANDSCAPE GARDENING. Under this branch will be taught the selection and propagation of shade and ornamental trees, shelter belts, shrubs, vines, flowering plants and lawn grasses, best modes of planting and cultivating; the arrangement of lawns, roads, and drive-ways, their construction and care.

The orchard, nursery and small fruit plantations upon the grounds of the Experiment Station, contiguous to the College grounds, afford excellent opportunity to gain practical ideas of horticulture, and students in this branch can acquire a good working knowledge of fruit culture and ornamental planting.

BIOLOGY.

DR. E. V. WILCOX.

Economic Entomology.—The life, history and habits of the different orders of insects will be treated in lectures so as to enable the student to appreciate the reason for adopting various methods for restraining injurious insects. The external anatomy of insects will be taught by lectures and dissections so that the student may recognize the orders and know what sort of treatment to apply in any particular case of insect attack. Special consideration will be had of the most noted and destructive insect enemies of various farm and garden crops, as well as of domestic animals, houses and articles of food. Several lectures will treat of insect-control and the natural and artificial remedies against noxious insects.

Veterinary Medicines.—Care of animals. Methods of giving medicines and applying remedies. General preventive measures and animal sanitation. Nature, use, effect and dose of the various drugs used in veterinary practice. Antidotes for poisons which affect animals.

Animal Diseases.—Comparative animal physiology. Functions of special organs. Specific, general and contagious diseases of animals. Pathological physiology and anatomy of organs. Diagnosis of diseases. Surgical and medical treatment of diseases. In the study of diseases and their treatment the student will have opportunity to see and assist at numerous operations on cases brought for treatment.

◆

SCHEDULE OF

COURSE IN CHEMISTRY.

FRESHMAN YEAR.

[Figures indicate the number of recitations, or the actual hours of practice per week.]

Fall Term.

Chemistry,	3:	Lectures on the Non-Metals.
Mathematics,	5:	Higher Algebra.
Language,	7:	German, 5.
		Rhetoric, 2.
History,	3:	Greek.
Practicums,	12:	Chemical Laboratory, 8.
		Mechanical Drawing, 4.

Winter Term.

Chemistry,	3:	Lectures on the Metals.
Mathematics,	5:	Higher Algebra, 3.
		Plane Trigonometry, 2.
Language,	7:	German, 5.
		Rhetoric, 2.
History,	3:	Roman.
Practicums,	12:	Qualitative Analysis, 8.
		Mechanical Drawing, 4.

Spring Term.

Chemistry,	2:	Stoichiometry.
Mathematics,	5:	Plane Trigonometry.
Language,	7:	German, 5.
		Rhetoric, 2.
History,	2:	Mediæval.
Practicums,	14:	Elementary Quantitative Analysis, 8.
		Bench Work, 6.

COURSE IN CHEMISTRY—SOPHOMORE YEAR.

Fall Term.

PHYSICS,	3:	General Properties. Mechanics and Heat.
BIOLOGY,	3:	Botany.
LANGUAGE,	7:	German, 5. American Literature, 2.
HISTORY,	2:	Mediæval and Modern.
ELOCUTION,	1:	
Practicums,	16:	Quantitative Analysis, 8. Physical Measurements, 4. Botanical Laboratory, 4.
SEMINARY,	1:	Journal Meetings.

Winter Term.

PHYSICS,	3:	Magnetism and Electricity.
BIOLOGY,	3:	Botany.
LANGUAGE,	7:	German. 5. American Literature, 2.
HISTORY,	2:	Modern.
ELOCUTION,	1:	
Practicums,	16:	Inorganic Chemical Preparations, 8. Physical Measurements, 4. Microscopy, 4.
SEMINARY,	1:	Journal Meetings.

Spring Term.

PHYSICS,	3:	Sound and Light.
LANGUAGE,	7:	German, 5. Shakespeare, 2.
HISTORY,	2:	Modern.
CHEMISTRY,	3:	Organic, Lectures.
BIOLOGY,	3:	Botany.
ELOCUTION,	1:	
Practicums,	14:	Organic Chemistry, Laboratory, 6. Botanical Laboratory, 4. Physical Measurements, 4.
SEMINARY,	1:	Journal Meetings.

SUMMER VACATION—MEMOIR.

COURSE IN CHEMISTRY—JUNIOR YEAR.

Fall Term.

CHEMISTRY,	8:	History of Chemistry, 2.
		Chemical Technology, 3.
		Chemical Philosophy, 3.
LANGUAGE,	2:	English Literature.
CIVICS,	3:	Constitutional History.
Practicum	20:	Quantitative Analysis.
SEMINARY,	2:	Journal Meetings, 1.
		Conferences, 1.

Winter Term.

CHEMISTRY,	6:	Theoretical Chemistry, 3.
		Metallurgy of Iron and Steel, 3.
LANGUAGE,	2:	English Literature.
LOGIC.	4:	Elements of Logic.
PHYSIOLOGY,	5:	Human Physiology.
BIOLOGY,	2:	Bacteriology,
Practicums,	14:	Quantitative Analysis, 10.
		Bacteriology, 4.
SEMINARY,	2:	Journal Meetings, 1.
		Conferences, 1.

Spring Term.

CHEMISTRY,	6:	Theoretical Chemistry, 3.
		Metallurgy of Copper, 3.
LANGUAGE,	2:	English Literature.
BIOLOGY,	3:	Economic Botany.
ECONOMICS,	5:	Principles of Political Economy.
Practicum,	15:	Quantitative Analysis.
SEMINARY,	2:	Journal Meetings, 1.
		Conferences, 1.

SUMMER VACATION—MEMOIR.

COURSE IN CHEMISTRY—SENIOR YEAR.

Fall Term.

Chemistry,	5:	Applied Chemistry.
Geology,	5:	Dynamical and Structural.
Mental Science,	5:	Psychology.
Practicums,	15:	Mineralogy, 10. Special Methods, 5.
Seminary,	2:	Journal Meetings, 1. Conferences, 1.

Winter Term.

Chemistry,	5:	Applied Chemistry.
Geology,	5:	Historical.
Social Science,	5:	Sociology.
Practicum,	15:	Assaying.
Seminary,	2:	Journal Meetings, 1. Conferences, 1.

Spring Term.

Geology,	3:	Economic Geology.
Moral Science,	5:	Principles of Ethics.
Thesis.	30:	Work in Laboratory and Library.
Seminary,	3:	Journal Meetings, 1. Conferences, 2.

THE COURSE IN CHEMISTY.

DR. TRAPHAGEN AND MR. COBLEIGH.

The purpose of the course in Chemistry is to make educated chemists—men who are not only qualified to make correct analyses of what may be handed them, but who have also had, with their technical training, a good liberal education. The possibilities of the successful application of chemical knowledge to the solution of the problems of daily life on the farm, in the smelter, in the dye works, in the sugar refinery, in the gas works, in nearly all manufactures and the arts, are too well appreciated to need any argument.

The range of chemical knowledge is too wide to-day to be covered by any one man, so it will be wise, when the student of the chemical course has covered the required work, for him to select some definite line of work which he may decide to make his specialty. This is quite possible, as each student does the greater part of his work, not in the class room, but individually in the laboratory and library.

A description of the work in Chemistry follows. For information concerning other studies taught in this course see remarks under General Science Course.

1. ***General Chemistry.***—Lectures on the general principles of chemistry, with frequent recitations. The properties, preparation and applications, of the elements and their principal compounds are here studied, and many problems involving quantitative relationships are solved. Text-book: Remsen's Advanced Chemistry.

2. ***Chemical Laboratory.***—Accompanying the above is this course of laboratory work, designed to illustrate experimentally the important laws before considered. The most difficult of these experiments are performed by the

instructor in presence of the class, after which the student is expected to repeat them.

3. ***Qualitative Analysis.***—A study of the reactions of the various salts, using first compounds of known composition, and later identifying "unknowns." Elementary blowpipe analysis will be given here.

4. ***Stoichiometry.***—Lectures and recitations on the mathematics of chemistry. The various mathematical problems arising in analytical chemistry are here considered.

5. ***Elementary Quantitative Analysis.***—This course consists mainly of volumetric analysis, and those elements are determined which can be without the use of the gravimetric method in any part in the standardizing of solutions. The gravimetric estimation of the constituents of some of the more common salts is also made here.

6. ***Chemical Philosophy.***—Lectures and recitations on the relations of light, heat, magnetism and electricity to chemistry, and their use in solving its problems.

7. ***Quantitative Analysis.***—Following closely the Waller-Cairn's Manual. The amount of work done in this subject depends upon the student, for while a certain minimum amount of work will be required, the maximum is only limited by the wishes and time of each student. After the required routine work is done the remainder of the student's analytical work will be selected with the purpose of best serving his individual needs.

8. ***Theoretical Chemistry.***—Lectures and recitations upon the theories of chemistry which have been advanced at various times and are now held. Text-books: Wurtz's History of Chemical Theory; Meyer's Modern Theories of Chemistry.

9. ***Inorganic Chemical Preparations.***—The preparation of chemically pure laboratory re-agents and other compounds; including qualitative and quantitative tests of the purity of the products. Manual: Vulte and Neustadt's Inorganic Chemical Preparations.

10. ***Organic Chemistry.***—This work consists of lectures, recitations and the preparation of a series of organic compounds, illustrating the properties of the leading classes. Methods of proximate and ultimate analysis will also be experimentally studied. Text-books: Remsen's Organic Chemistry; Orndorff's Manual of Organic Chemistry.

11. ***Chemical Technology.***—Lectures and recitations on Fuels, Refractory Materials, Explosives, Limes, Mortars and Cements, Building Stones, Timber and its preservation, and Metals not considered elsewhere. Text-book: Wagner's Chemical Technology.

12. ***Applied Chemistry.***—A continuation of the work in Chemical Technology. The subjects studied are the manufacture of acids, alkalies, salts, etc.

13. ***Industrial Chemistry.***—A conclusion of the work in Chemical Technology. The subjects discussed are; Air, Water, Food and Drink, Fibers, Glue, Soap, Dyes, etc.

14.—***Special Work in Chemical Laboratory.***—Study of new analytical methods and comparison of various methods to determine accuracy and time required for completion of analysis.

15. ***Metallurgy.***—Lectures on the production of the metals from their ores, the effects of various impurities and their elimination. Especial attention is given to the calculation of furnace charges.

16. ***Assaying.***—The situation of our College makes a thorough course in Assaying one of the most important needs, and to meet it we have secured a set of samples and apparatus, and have outlined a course of work which will fully meet the requirements. We shall be able to reproduce all the conditions of the mill or commercial assay office, and to give a thoroughly practical course. Before completing the course the student is given a practical series of samples, representing the daily work of the assayer of a mill or smelter, and will be required to return accurate results within the time usually occupied by the commercial assayer.

17. ***Journal Meetings—Abstracting.***—In order to develop in the student a habit of careful reading, each student will be required to make abstracts of articles on assigned subjects from the leading journals, and present them at a weekly meeting of students and department instructors, where the topics are freely discussed. They are thus kept in touch with the progress of the science.

18. ***Conferences.***—Regular meetings for the discussion of the progress of the work of the various students in the laboratory. In this way students and instructors are made acquainted with each other's work, and the student is encouraged to greater effort.

19. ***History of Chemistry.***—Lectures on the development of chemistry and upon the contributions of different chemists to its progress.

20. ***Thesis.***—In the early part of the Senior year the student selects the subject for his graduation thesis. The work done must include a considerable amount of original research.

21. ***Photography.***—At some time during the course an opportunity will be afforded students for the study of the general principles of photography, with practice in exposing, developing, fixing, printing and toning. Various developers will be used and comparisons made of different plates and papers. A very successful camera club existing under the auspices of the College is a great aid in creating interest in this art among the students.

SCHEDULE OF

THE HOME SCIENCE COURSE.

FRESHMAN YEAR.

(Figures indicate the number of recitations, or the actual hours of practice per week,)

Fall Term.

MATHEMATICS,	5:	Higher Algebra.
LANGUAGE,	7:	Latin, or German, or French, 5.
		Rhetoric, 2.
HISTORY,	3:	Greek.
CHEMISTRY,	3:	Lectures on the Non-Metals.
Practicums,	12:	Chemical Laboratory, 6.
		Art, 6.

Winter Term.

LANGUAGE,	7:	Latin, or German, or French, 5.
		Rhetoric, 2.
HISTORY,	3:	Roman.
MATHEMATICS,	3:	Higher Algebra.
CHEMISTRY,	3:	Lectures on the Metals.
DOMESTIC SCIENCE,	3:	Lectures on Household Economy.
Practicums,	14:	Chemical Laboratory, 6.
		Art, 4.
		Cooking, 4.
OPTIONAL,	2:	Plane Trigonometry.

Spring Term.

LANGUAGE,	7:	Latin, or German, or French, 5.
		Rhetoric, 2.
HISTORY,	3:	Mediæval.
CHEMISTRY,	2:	Stoichiometry.
Practicums,	22:	Chemical Laboratory, 8.
		Art, 6.
		Dress-Making, 8.
OPTIONAL,	5:	Plane Trigonometry.

HOME SCIENCE COURSE—SOPHOMORE YEAR.

Fall Term.

LANGUAGE,	6 or 7:	Latin, 4, or German, or French, 5. American Literature, 2.
HISTORY,	2:	Mediæval and Modern.
BIOLOGY,	5:	Botany, Lectures, 3. Zoology, Lectures, 2.
ELOCUTION,	1:	
Practicums,	17:	Biological Laboratory, 6. Art, Applied Design, 4. Cooking and Canning, 4. Embroidery, 3.
OPTIONAL,	5:	Analytic Geometry.

Winter Term.

LANGUAGE,	6 or 7:	Latin, 4, or German, or French, 5. American Literature, 2.
BIOLOGY,	5:	Botany, Lectures, 3. Zoology, Lectures, 2.
HISTORY,	2:	Modern.
ELOCUTION,	1:	
Practicums,	16:	Biological Laboratory, 6. Art, Applied Design, 6. Bills of Fare and Cooking, 4.
OPTIONAL,	5:	Calculus.

Spring Term.

LANGUAGE,	6 or 7:	Latin, 4, or German, or French, 5. Shakespeare, 2.
HISTORY,	2:	Modern.
BIOLOGY,	5:	Botany, Lectures, 3. Zoology, Lectures, 2.
ELOCUTION,	1:	
Practicums,	20:	Biological Laboratory, 6. Organic Chemistry, 10. Art, Oil and Water Color, 4.
OPTIONAL,	5:	Calculus.

HOME SCIENCE COURSE—JUNIOR YEAR.

Fall Term.

PHYSICS,	3:	General Properties, Mechanics and Heat.
CIVICS,	3:	Constitutional History.
LANGUAGE,	2:	English Literature.
DOMESTIC SCIENCE,	3:	Household Sanitation.
CHEMISTRY,	2:	Chemistry of Foods.
Practicums,	18:	Art, Wood Carving, 10. Physics, Laboratory, 4. Chemical Laboratory, 4.
ELECTIVES,	2 or 3:	One of the following: Astronomy, 3. Differential Equations, 2.

Winter Term.

PHYSICS,	3:	Electricity and Magnetism.
CIVICS,	3:	Constitutional Law.
LANGUAGE,	2:	English Literature.
DOMESTIC SCIENCE,	2:	Hygiene and Emergencies.
BIOLOGY,	7:	Human Physiology, 5. Bacteriology, Lectures, 2.
Practicums,	16:	Physics, Laboratory, 4. Biological Laboratory, 4. Art, Life Class, 4. Hygienic Cooking, 4, or Sewing, 4.

Spring Term.

PHYSICS,	3:	Sound and Light.
LANGUAGE,	2:	English Literature.
HORTICULTURE,	5:	
LANDSCAPE GARDENING,	3:	
Practicums,	8:	Physics, Laboratory, 4. Art, Painting from Nature, 4.
ELECTIVES,	5:	One of the following: Principles of Political Economy, 5. History of Philosophy, 5. Human Physiology, 5.

DINING ROOM

SEWING ROOM

KITCHEN

HOME SCIENCE COURSE—SENIOR YEAR.

Fall Term.

Geology,	5:	Dynamical and Structural.
Philosophy,	5:	Psychology.
Language,	2:	English Literature.
Electives,	20:	One of the following: Art, 20. Domestic Science –Original Investigation, 20.

Winter Term.

Social Science,	5:	Sociology.
Language,	2:	English Literature.
Electives,	25:	Two of the following: Historical Geology, 5. Psychology, 5. Art, 20. Domestic Science—Original Investigation, 20.

Spring Term.

Moral Science,	5:	Principles of Ethics.
Language,	2:	English Literature.
Thesis.		
Practicums,	6:	Sewing.
Electives,	3 or 5:	One of the following: Economic Geology, 3. Psychology, 5.

HOME SCIENCE COURSE.

The course in Home Science provides systematic schemes for study in those branches which are directly related to healthful living, appropriate clothing, and household decoration. The object of the course is to produce good home makers. Based upon the General Science Course, but providing also liberal courses in Domestic Science and Industrial Art, the instruction is both theoretical and practical.

The descriptions of the general courses will be found under the General Science Course. The special courses are:

DOMESTIC SCIENCE.

MISS HARKINS.

Sewing.—All the ordinary forms of sewing are taught, including garment making, dress making and embroidery. The work is carefully graded according to the capabilities of the student, and may be utilized by her in the making of her own clothing. A straight line system of cutting and fitting is taught, and systems are furnished at cost.

Household Economy.—Lectures embracing such subjects as food stuffs and their nutritive value, marketing, neatness and order in housekeeping, preparation and serving of foods, food for the well, food for the sick, and talks on etiquette.

Household Sanitation.—Lectures pertaining to the proper care of the home and its inmates.

Hygiene and Emergencies.—Lectures treating of the laws of health and home nursing.

Cooking.—The object of the work in cooking is to familiarize the student with the most economical, healthful and attractive methods of preparing and serving foods. Special attention is given to hygienic cookery.

The economic value of the Aladdin oven is demonstrated, and a short course is given with the chafing dish. Special attention is paid to table laying and decoration, and serving of meals.

ART.

MRS. MARSHALL.

For the Art work of the Freshman and Sophomore years see the first two years of the General Science Course.

JUNIOR YEAR.

Figure Study.—In this year there is a life class, open to all who show talent for figure drawing. Study of costume. Painting in oil and water color. Lectures on decoration of interiors.

SENIOR YEAR.

Any branch preferred by the student. Otherwise further instruction in branches already begun by the student. China painting, if desired.

For a detailed account of the work in English, Latin, History, Mathematics, Biology and Chemistry, see the General Science Course.

SCHEDULE OF

COURSE IN MECHANICAL ENGINEERING.

FRESHMAN YEAR.

[Figures indicate the number of recitations, or the actual hours of practice per week.]

Fall Term.

MATHEMATICS,	5:	Higher Algebra.
LANGUAGE,	2:	Rhetoric.
HISTORY,	3:	Greek.
CHEMISTRY,	3:	Lectures on the Non-Metals.
Practicums,	22:	Chemical Laboratory, 6.
		Drawing : Free-hand Sketching and Lettering, 8,
		Shops : Carpentry, 8.

Winter Term.

MATHEMATICS,	7:	Higher Algebra, 3.
		Plane Trigonometry, 2.
		Descriptive Geometry, 2.
LANGUAGE,	2:	Rhetoric.
HISTORY,	3:	Roman.
CHEMISTRY,	3:	Lectures on the Metals.
Practicums,	18:	Chemical Laboratory, 6.
		Drawing : Descriptive Geometry Problems, 4.
		Shops : Carpentry and Wood Turning. 8.

Spring Term.

MATHEMATICS,	7:	Plane Trigonometry, 5.
		Descriptive Geometry, 2.
CHEMISTRY,	2:	Stoichiometry.
LANGUAGE,	2:	Rhetoric.
HISTORY,	3:	Mediæval.
Practicums,	20:	Quantitative Analysis, 8.
		Drawing : Descriptive Geometry Problems, 4.
		Shops : Pattern Making, Chipping and Filing, 8.

MECHANICAL ENGINEERING COURSE—SOPHOMORE YEAR.

Fall Term.

Mathematics,	5:	Analytical Geometry.
History,	2:	Mediæval and Modern.
Book-Keeping,	5:	
Physics,	3:	General Properties, Mechanics and Heat.
Elocution,	1:	
Practicums,	18:	Physical Measurements, 4.
		Drawing: From Machines, Models, and Plates, 6.
		Shops: Forge Work, 8.

Winter Term.

Mathematics,	5:	Calculus.
History,	2:	Modern.
Machine Design,	3:	Constructive Materials of Engineering.
Physics,	3:	Magnetism and Electricity.
Elocution,	1:	
Practicums,	20:	Physical Measurements, 4.
		Drawing: From Machines and Models, 10.
		Shops: Lathe Work, 6.

Spring Term.

Mathematics,	5:	Calculus.
History,	2:	Modern.
Chemistry,	3:	Metallurgy of Copper.
Physics,	3:	Sound and Light.
Elocution,	1:	
Practicums,	24:	Physical Measurements, 4.
		Metallurgical Chemistry, 10.
		Drawing: Tracing and Blue Printing, 4.
		Shops: Foundry Work.

MECHANICAL ENGINEERING COURSE—JUNIOR YEAR.

Fall Term.

MATHEMATICS,	5:	Analytic Mechanics.
ELECTRICAL ENGINEERING,	5:	Theory of Direct Current Dynamos and Motors.
CIVIL ENGINEERING.	2:	Elementary Surveying, Lectures.
MACHINE DESIGN,	2:	Kinematics,
Practicums,	18:	Surveying: Field Work, 6. Drawing: Problems in Kinematics, 6. Shops: Planing and Milling, 6.

Winter Term.

MATHEMATICS.	5:	Analytic Mechanics, 1. Applied Mechanics, 4.
STEAM ENGINEERING,	3:	Indicators, Valve Gears, and Link Motions.
MACHINE DESIGN,	3:	Graphic Statics of Mechanisms, 2. Stresses in Framed Structures, 1.
Practicums,	26:	Drawing: Problems in Graphic Statics, 10. Dynamo Design, 4. Mechanical Laboratory: Indicators and Valve Gears, 6. Shops: Gear Cutting, 6.

Spring Term.

MATHEMATICS,	5:	Applied Mechanics.
STEAM ENGINEERING,	2:	Steam Boilers.
MACHINE DESIGN,	5:	Hoisting and Conveying Machinery, 3. Heating and Ventilating Machinery, 2.
Practicums,	22:	Drawing: Problems in Machine Design, 10. Mechanical Laboratory: Tests of the Strength of Materials, 6. Shops: Tool Making, 6.

MECHANICAL ENGINEERING COURSE—SENIOR YEAR.

Fall Term.

Steam Engineering,	5:	Thermodynamics of the Steam Engine.
Machine Design,	5:	Mining Machinery, 2. Steam Engine Design, 2. Seminary, 1.
Practicums,	28:	Drawing: Steam Engine Design, 6. Senior Model, 10. Mechanical Laboratory: Steam Engine and Boiler Experiments, 6. Shops: Senior Model, 6.

Winter Term.

Thermodynamics,	3:	Gas Engines and Refrigerating Machinery.
Hydraulics,	5:	Hydrodynamics and Hydraulic Motors, 3. Masonry Dams and Retaining Walls, 2.
Civics.	3:	Constitutional Law.
Practicums,	24:	Drawing, 10. Chemistry: Assaying, 8. Shops: Constructing and Erecting, 6.

Spring Term.

Power Transmission,	3:	Lectures.
Electrical Engineering,	2:	Electrical Mining Machinery.
Economics,	5:	Principles of Political Economy.
Thesis.		
Practicums,	6:	Hydraulic Laboratory, 2. Shops, 4.

MECHANICAL ENGINEERING.

PROF. WILLIAMS AND MR. MCCORMICK.

This course deals with the science of machines. In order that the student may be capable of intelligently and skillfully designing, constructing and supervising all kinds of machinery, he should pursue a thorough course in which the theoretical goes hand in hand with the practical.

While a broad theoretical training is of primary importance, it is believed that from continued practical applications of theoretic conclusions, a broader and more tangible conception of their truths may be derived. To explain theoretic principles, however, is not the only value of the experimental work of the course. If the student desires to go from College to the constructive or operative world, he must be familiar with working machines, methods of shop management, and as much of the every day detail of the machinist's work as it is possible for him to acquire, as a supplement to his higher training.

While it is highly desirable that the engineer should be a man of broad, general culture, the technical requirements of the course are so exacting that the student of Mechanical Engineering has little time to spare for culture work. To obviate the disadvantage arising from this fact some general studies are introduced into the course, in order to make it as broad and comprehensive, as is consistent with a thorough training in the direct line chosen.

The outline of the work is as follows:

English.—Sub-course 1. (See General Science Course.)

History.—Sub-courses 1 and 2. (See General Science Course.)

CHEMISTRY AND PHYSICS.

(For Description of Sub-courses, See Course in Chemistry.

1, 2. ***General Chemistry.***—Lectures and laboratory.

3. ***Qualitative Analysis.***

4. ***Stoichiometry.***

5. ***Elementary Quantitative Analysis.***

7. ***Metallurgical Chemistry.***—A laboratory course accompanying sub-course 3, Machine Design, and sub-course 15, Chemistry.

15. ***Metallurgy of Copper.***—Lectures.

16. ***Assaying.***

Physics.—The same as for the General Science Course. In addition, students can elect advanced work in Physical Measurements, during their Junior year.

CIVICS AND ECONOMICS.

For descriptions of Sub-courses in *Book-keeping*, *Constitutional Law and Principles of Political Economy*, see General Science Course.

MATHEMATICS.

For the work in *Higher Algebra*, *Trigonometry*, *Analytic Geometry and Calculus*, see General Science Course.

Descriptive Geometry.—Projection of lines, planes, surfaces and solids; intersections, tangents to curves and surfaces; problems in warped surfaces, linear perspective, isometric projection. The class room exercises are accompanied by work in the draughting room.

MECHANICS.

1. ***Analytic Mechanics.***—Shaped with special reference to the practical requirements of engineers, principles rather than formulas are emphasized. Deals with statics, kine-

matics, kinetics, energy, center of gravity, moment of inertia, friction and units and dimensions and mechanical quantities.

2. ***Applied Mechanics.***—The strength and elastic properties of the most important materials of construction from a theoretical standpoint. Applications of theory to practical problems in beams, columns, shafts, rivetings, springs, etc., followed by a laboratory course in testing. Text-book: Church's Mechanics of Engineering.

3. ***Hydraulics.***—Hydrostatic pressure, theory of fluid motion, theoretical and experimental formulas for flow through orifices and pipes, over weirs, in conduits, canals and streams; accompanied by a course in hydraulic laboratory. A short course in the construction of masonry dams and retaining walls will be given in this connection.

4. ***Testing of Materials of Construction.***—Each student is required to make a definite series of tests of wrought iron, cast iron, steel and wood, in tension, compression, bending and torsion.

MACHINE DESIGN.

1. ***Elements of Drawing.***—The use of drawing instruments and plain lettering, sketching of machine parts; methods of projection; geometrical drawing problems to teach accuracy in the use of instruments; accompanied by occasional lectures.

2. ***Draughting, Tracing and Blue Printing.***—During this course drawings are made from machines, models and plates, the object being to give the student a general idea of the forms of machine parts and the methods of putting them together. The plates used are duplicates of drawings in use for standard machine construction. Finally an entire machine of moderate complexity is taken as a model from which complete working drawings, tracings and blue prints are made. The student is taught to make working drawings, rather than elaborately finished plates.

3. ***Constructive Materials of Engineering.***—Special attention is given to the methods of production, composition, and physical properties of iron and steel, and the effects of heat treatment and methods of working. Sufficient time is also given to the most important special steels, alloys, brasses and bronzes. This course is supplemented by a course in metallurgical chemistry.

4. ***Kinematics.***—A study of the relative motions of machine parts, including belting, toothed gears, cams and linkages. The class room work is supplemented by a parallel course of drafting.

5. ***Graphic Statics.***—General theory of graphic statics, with application: (a) to the determination of stresses in framed structures, under fixed loads, (b) to finding the external forces acting on machine members, and the proper design of machine parts to resist the applied forces. The course consists of both class room work and drafting.

6. ***Hoisting and Conveying Machinery.***—A theoretical and practical discussion of such forms of hoisting and conveying machinery as are commonly found in mines, factories, railway plants and docks. In the drafting room the student will work out a design for some machine of this class.

7. ***Heating and Ventilating Machinery.***—Lectures on the theory and practice of heating and ventilating as applied to buildings and mines, and the machinery and apparatus used for such purposes. The questions of efficiency and economy will be considered. Good opportunity for observation and experiment is afforded by the heating and ventilating apparatus used in the College buildings.

8. ***Mining Machinery.***—A course of lectures on this subject covering pumps, air compressors, drills, etc., and the management and care of such machinery.

9. ***Steam Engine.***—The constructive details of some type of automatic cut-off engine will be worked out in the class room, and working drawings therefor made in the drafting room.

10. ***Senior Model.*** Each class will be expected to design, make drawings for, and construct in the College shops, some useful piece of machinery or apparatus, as a part of the work of their senior year. The College will furnish the necessary materials, and the machine on completion will become a part of the College equipment.

Surveying.—The elements of this science are taught, which includes the theory of surveying, the use of the compass, transit, level, chain and rods; all adjustments of instruments; surveying of fields, running of levels, triangulation, computation of areas and earthwork. Both class room and field work.

Dynamo and Motor Design.—Electrical Engineering, sub-course 1.

Electrical Mining Machinery.—Electrical Engineering, sub-course 7.

Power Transmission.—Lectures on the various methods of transmitting power, including shafting, rope, belt, and toothed gearing; hydraulic, pneumatic and electrical transmission; the adaptability and efficiency of each.

STEAM ENGINEERING.

1. ***Indicators and Valve Gears.***—A study of the slide valve, both in its simple form and when used in combination with independent cut-off valves, link-motions, and other reversing gears; automatic cut-off gears, and the Zeuner diagram; principles and operation of the indicator.

1 (a). A Laboratory course in valve setting; testing and calibrating gauges, indicator springs, thermometers, etc.; care and manipulation of the steam engine, and the taking of indicator cards.

2. ***Steam Boilers.***—A study of their general construction as to strength and form, their advantages and disadvantages; styles of riveting and bracing; tubes, grate areas, and heating surfaces; boiler settings, injectors and feed pumps, and boiler efficiencies.

2 (a). **Steam Engine and Boiler Testing.**—Complete tests of power plants, including the efficiencies of boiler and engine; calorimeter tests of the quality of steam. Each student is required to perform all the operations necessary for conducting an accurate trial, and to work out the data for an entire test, as well as for individual tests.

3. **Thermodynamics.**—A thorough course in theory, and its application, especially to steam engines.

3 (a). The Laws of Thermodynamics as applied to gas engines and refrigerating machinery.

SHOP WORK.

1. **Carpentry.**—The use and care of tools; exercises on the most useful joints and splices; rabbeting, gaining and plowing; framing of timber structures. Each student will be required to frame and erect a miniature building of moderate complexity. The practice work will be preceded by lectures. *Fall term and half of Winter term, Freshman year.*

2. **Wood Turning and Pattern Making.**—A systematic course at the lathe and bench in the use of the gouge and chisel in plain and ornamental turning and pattern making; accompanied by occasional lectures. *Half of Winter and Spring Terms, Freshman year.*

3. **Chipping and Filing.**—Practice in wrought and cast iron with the hammer, chisel and file at the vise; use of the file and scraper in the production of flat surfaces and straight edges. *Half of Spring term, Freshman year.*

4. **Forge Work.**—The fundamental features of forge practice, such as drawing, upsetting, bending and welding; abundant exercises on the most common and useful forgings; annealing, hardening and tempering steel; making of punches and chisels.

5. **Lathe Work.**—Instruction in the use and care of lathe and turning tools, squaring up, the proper maximum

speeds for cutting metals, turning to exact size, the use of calipers, cutting threads, squaring up and finishing nuts; reaming, inside boring; drilling, filing and polishing with the speed lathe; drilling and countersinking with the different shop drills. Lectures weekly.

6. ***Foundry Work.***—Lectures on the principles of pattern making and moulding, core making and core work, with accompanying shop exercises.

7. ***Planing and Milling.***—The uses of the planing, shaping and universal milling machines and their comparative advantages are brought out by suitable exercises, designed to show also the time necessary for the same class of work on each machine.

8. ***Gear Cutting,***—This includes methods for determining the diameter of blanks for spur, bevel, and spiral gears on the lathe, and cutting the teeth on the milling machine.

9. ***Tool Making.***—The correct forms of turning tools and the principles of grinding them; making taps, dies, countersinks, reamers and mandrels; fluting with the milling machine, hardening and grinding on the universal grinder.

10. ***Senior Model.***—The entire time will be devoted to the pattern making, machine work, and erecting of the Senior Model. This is designed to give students a good opportunity for applying in actual constructive work the elements of machine work which they have learned in the previous three years of practice.

Library Work.—The library is well supplied with standard works of reference and the leading engineering periodicals. Weekly meetings will be held to encourage students in the use of current engineering literature.

Thesis.—Before graduation each student must present a suitable thesis, which shall be the result of original investigation. The subject must be chosen at the beginning of the Senior year.

SCHEDULE OF

COURSE IN ELECTRICAL ENGINEERING.

FRESHMAN AND SOPHOMORE YEARS.

The same as for the Mechanical Engineering Course.

JUNIOR YEAR.

(Figures indicate the number of recitations, or the actual hours of practice per week.)

Fall Term.

Mathematics,	5:	Analytic Mechanics.
Electrical Engineering,	5:	Theory of Direct Current Dynamos and Motors.
Machine Design,	2:	Kinematics.
Practicums,	22:	Drawing: Problems in Kinematics, 6. Physics: Electrical Measurements, 10. Shops: Planing and Milling, 6.

Winter Term.

Mathematics,	5:	Analytic Mechanics, 1. Applied Mechanics, 4.
Steam Engineering,	3:	Indicators, Valve Gears, and Link Motions
Machine Design,	3:	Graphic Statics of Mechanisms, 2. Stresses in Framed Structures, 1.
Practicums,	28:	Drawing: Problems in Graphic Statics, 10 Dynamo Design, 4. Mechanical Laboratory: Indicators and Valve Gears, 6. Electrical Laboratory: Dynamo and Motor Testing, 8.

Spring Term.

Mathematics,	5:	Applied Mechanics.
Steam Engineering,	2:	Steam Boilers.
Electrical Engineering,	3:	Primary and Secondary Batteries.
Machine Design,	3:	Hoisting and Conveying Machinery.
Practicums,	22:	Drawing: Hoisting Machinery, 6. Mechanical Laboratory: Tests of the Strength of Materials, 6. Electrical Laboratory: Primary and Secondary Batteries, 4. Shops: Gear Cutting, 6.

ELECTRICAL ENGINEERING COURSE—SENIOR YEAR.

Fall Term.

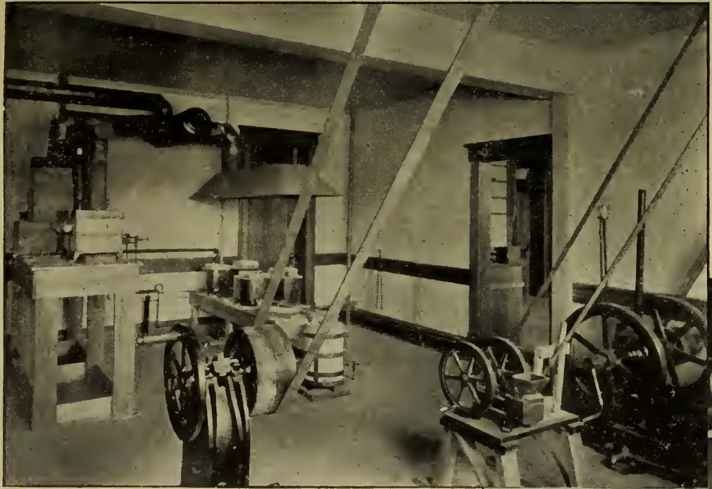
Electrical Engineering,	5:	Theory and Application of Alternating Currents.
Steam Engineering,	5:	Thermodynamics of the Steam Engine.
Civil Engineering,	2:	Elementary Surveying, Lectures.
Machine Design,	1:	Seminary.
Practicums,	25:	Drawing: Commercial Electrical Machinery, 10. Mechanical Laboratory: Steam Engine and Boiler Experiments, 6. Surveying: Field Work, 6. Electrical Laboratory: Alternating Currents, 3.

Winter Term.

Electrical Engineering,	7:	Theory and Application of Alternating Currents, 2. Electric Light and Power Transmission, 3. Electrolysis and Electro-Metallurgy, 2.
Hydraulics,	5:	Hydrodynamics and Hydraulic Motors, 3. Masonry Dams and Retaining Walls, 2.
Civics,	3:	Constitutional Law.
Practicums,	12:	Drawing: Alternating Current Machinery, 4. Electrical Laboratory: Alternating Currents, 4. Electro-Metallurgy, 4.

Spring Term.

Electrical Engineering,	5:	Electric Railways, 3. Electrical Mining Machinery, 2.
Economics,	5:	Principles of Political Economy.
Thesis.		
Practicums,	5:	Hydraulic Laboratory, 2. Electrical Laboratory: Polyphase Testing, 3.



Assay Laboratory

A Corner of the Forge Shop

ELECTRICAL ENGINEERING.

PROF. WILLIAMS.

During the past twenty-five years electrical discoveries and inventions have multiplied at a phenomenal rate, and the commercial applications of electricity are now so numerous and so constantly increasing as to make it one of the leading branches of engineering. Its great and growing commercial importance in Montana makes it peculiarly fitting that the State Technical School should offer a course in Electrical Engineering to its students.

The general aim of the course will be to thoroughly ground the student in the scientific laws forming the basis of his profession, at the same time training him to adapt these laws to practice, to use his judgment, and apply strictly accurate and honest methods in all operations.

It is evident that a line of study which accomplishes the ends suggested will furnish an excellent mental training, but it is thought important to introduce additional studies especially adapted to furnish a broad and general culture. Hence a considerable amount of time is allowed for the study of language, history and political science.

As the well equipped electrical engineer must have a thorough knowledge of the principles of Steam and Hydraulic Engineering, Machine Design and the Mechanics of Machinery, in addition to the subjects directly belonging to his special department, this course has been based on that in Mechanical Engineering, differing essentially from it only in the technical courses of the Junior and Senior years.

A description of the fundamental subjects common to the two courses will be found under the title of the Mechanical Engineering Course. The special subjects of this course are as follows:

1. ***Direct Current Dynamos and Motors.***—The principles of electromagnetism, the laws of simple magnetic circuits, and the winding of electromagnets; principles, design, construction, and testing of direct-current dynamos and motors. The theoretical work will be followed by the complete design, in the draughting-room, of a dynamo or motor. Textbook: Jackson's Electro-Magnets and Dynamo Construction.

1 (a). ***Dynamo and Motor Testing.***—A laboratory course in which students determine the characteristic curves, resistances, inductances, magnetic leakage, and efficiencies of various types of direct-current machines.

2. ***Batteries.***—Construction and working of primary and secondary batteries, and their commercial use. In connection with the class room work, students will make comparative, efficiency, and regulation tests of various standard types of primary and secondary batteries. On account of the rapidly increasing use of accumulators, the greater part of the course will be devoted to them.

3. ***Alternating Currents.***—The theory of the generation and utilization of alternating currents; the design and construction of alternating current dynamos, transformers, and motors; methods of testing alternating current machinery. In connection with this course, the student will work out, in the draughting room, complete designs for several commercial alternating current machines. Textbook: Jackson's Alternating Currents and Machinery.

3 (a). ***Alternating Current Testing.***—Laboratory tests to determine self-induction, capacity, and mutual induction of alternating current circuits; regulation and efficiency of transformers, dynamos and motors; polyphase testing in the Spring term.

4. ***Electrolysis and Electro-Metallurgy.***—Electrolytic theory, and its practical applications to electrotyping, electroplating, the treatment of ores, and electrolytic separation and refining of metals. Lectures and laboratory work.

5. ***Electric Light and Power Transmission.***—A study of the different systems of distribution used in arc and incandescent lighting, the advantages and disadvantages of each; the selection and arrangement of machinery for generating plants; the location, erection and cost of distributing lines; the transmission and distribution of power by direct current, single and polyphase alternating current systems.

6. ***Electric Railways.***—Selection, installation, and arrangement of engines, boilers and generators for city and suburban power plants; types of apparatus, and methods of control in power house, and on cars; erection and testing of circuits; car equipments and wiring; methods of track location, construction and maintenance; selection of equipment for special conditions; storage battery traction, and storage battery auxiliaries.

7. ***Electrical Mining Machinery.***—The special applications of electrical power in mining operations, electrical pumps, air compressors, hoists, drills and cutters; electrical haulage; electric lighting and ventilation of mines.

Electrical Measurements.—A laboratory course in measurements of precision; calibration and testing of instruments, using the voltameter, standard cell, Kelvin balance, etc.; determination of magnetic induction, permeability, and hysteresis losses by the ballistic method; testing of electric lines for the location of faults and grounds.

Journal Reading is encouraged, and frequent conferences will be held to discuss topics of interest in the current periodicals. The library is well supplied with leading engineering periodicals, transactions of engineering societies, and standard books of reference.

Thesis.—Before graduation each student must present a suitable thesis, which shall be the result of original investigation. The subject must be chosen at the beginning of the Senior year.

MILITARY SCIENCE.

George P. Ahern, Captain 25th Infantry, has been detailed by the Secretary of War for the purpose of instructing the students in military science and tactics.

Military Drill is required of all male students, unless excused by the faculty for special reasons, and satisfactory work in this department will be a requisite to graduation.

Object.—The object of instruction in this department is to improve the habits and manners of the students, and also for the development of health and physical form, but at the same time it gives that military knowledge which every citizen should possess, that he may render intelligent aid to his country or state in case of emergency.

It cultivates a manly spirit, a ready and implicit obedience to orders, a respect for authority, and a self-restraint which are of inestimable value to the young man on leaving College.

Instruction is both theoretical and practical.

Practical.—This instruction begins with the school of the soldier, including the setting up exercises, military gymnastics and bayonet exercise, which give an erect and soldierly bearing.

The squad drill will be followed by company and battalion drill.

Artillery Instruction will consist in the care and service of two field pieces. Considerable attention will be given to target practice, military signaling, practice marches, and camping. The College is supplied with tents, Springfield rifles, two field pieces of artillery, and a liberal supply of ammunition.

Theoretical.—Elementary instruction will be given by means of lectures and recitations in the Art and Science of War, armies and their organization, modern tactics, small arms, explosives, care of troops in the field, military correspondence and reports, military and martial law, including the relations between the military and the civil.

War Department Record.—At the close of the year the names of the three cadets in the graduating class, most distinguished in military science and tactics, are reported to the War Department for insertion in the United States Army Register. The military instruction will occupy about three hours weekly, and will not interfere with the students' regular work.

Uniform.—Students will be expected to provide themselves with the regulation military uniform, which is both inexpensive and durable.

No person will be allowed to take military drill who is not doing other College work.

REQUIREMENTS FOR ADMISSION.

Candidates for the Freshman class, in any of the College courses, must be graduates of the Preparatory Department, of an accredited High School, or pass a satisfactory examination upon the subjects included in the Preparatory Course, or their equivalent. The schedule of the Preparatory Course indicates the amount and character of the entrance work required.

Advanced Standing.—This College will accept records from all reputable Colleges for credits for advanced standing. Such records are accepted so far as they cover, or are equivalent to, the work done in the course in which the candidate applies for advanced standing.

DEGREES.

Upon the satisfactory completion of any of the College courses the following degrees will be conferred:

For the General Science Course and the Home Science Course, the degree of

BACHELOR OF SCIENCE.

For the Course in Agriculture, the degree of

BACHELOR OF SCIENTIFIC AGRICULTURE.

For the Course in Chemistry, the degree of

BACHELOR OF ANALYTICAL CHEMISTRY.

For the Course in Mechanical Engineering, the degree of

BACHELOR OF MECHANICAL ENGINEERING.

For the Course in Electrical Engineering, the degree of

BACHELOR OF ELECTRICAL ENGINEERING.

ADVANCED DEGREES.

On the completion of one year of post-graduate work, or three years of professional work, and the presentation of an acceptable thesis, the College will confer upon the holders of Bachelors' Degrees, in their respective courses, the degrees of *Master of Science, Master of Scientific Agriculture, Analytical Chemist, Mechanical Engineer, and Electrical Engineer.*

ACCREDITED HIGH SCHOOLS.

The State Board of Education at a meeting held June 1, 1896, took the following action:

1. ***Candidates*** seeking admission to any of the regular courses in any of the State Educational Institutions must be at least sixteen years of age, and must possess a good moral character and good bodily health.

2. *Accredited Schools.*—Any high school or academy whose course of instruction covers the branches requisite for admission to one or more of the courses of any State Educational Institution may be admitted to its accredited list of preparatory schools, after a satisfactory examination by a committee appointed by the State Board of Education. Application for such examination may be made by any school board to the Secretary of the State Board of Education, whereupon a committee appointed by the State Board of Education will examine the course of study and methods of instruction of the school, and on the committee's favorable recommendation, and concurrence of the State Board of Education, it will be entered upon the accredited list of the State Educational Institution for which it applied. Any graduate of such an approved school will be received by the President of the State Educational Institution wherein said graduate is entitled to enter, on presentation of proper diploma and certificate from the Superintendent of said school, into any of the courses of said institution for which said graduate has been fitted.

Students of an accredited school who are not graduates must expect examinations as other candidates.

A school once entered upon the accredited list will remain there until its administration is changed, or until notice is given by the State Board of Education of unsatisfactory results. Upon a change of administration application for continuation upon the list, if desired, must be made. If the work of the Principal coming into charge has been recently examined in connection with some other school, a new examination may not be required, but such examination should in all cases be invited.

Annual reports will be asked for by the State Board of Education from all accredited schools. The list of accredited schools is as follows:

Anaconda,
Bozeman,
Butte,
Great Falls,
Helena,
Kalispell,
Miles City,
Missoula.

PREPARATORY COURSE.

First Year.

(Figures indicate number of exercises per week.)

FALL TERM.	WINTER TERM.
Grammar, 4.	Grammar, 4.
Arithmetic, 5.	Arithmetic, 5.
Geography, 3.	Geography, 3.
U. S. History, 2.	U. S. History, 2.
Penmanship, 3.	Penmanship, 3.
Reading and Literature, 3.	Reading and Literature, 3.
* Sewing, 6.	* Sewing, 6.

SPRING TERM.

Grammar, 4.
Arithmetic, 5.
Geography, 3.
U. S. History, 2.
Penmanship, 3.
Reading and Literature, 3.
*Sewing, 6.

Second Year.

FALL TERM.	WINTER TERM.
English Composition, 4.	English Composition, 4.
Elocution, 1.	Elocution, 1.
Algebra, 5.	Algebra, 5.
Anatomy, 3.	Physiology, 3.
Etymology and Literature, or Latin, 5.	Etymology and Literature, or Latin, 5.
Drawing, 4.	Drawing, 4.

SPRING TERM.

Algebra, 5.
Elocution, 2.
Civics, 4.
†Horticulture, 3.
Etymology and Literature, or Latin, 5.
Drawing, 4.
*Cooking, 9.

---

*Required of girls. †Required of boys.

PREPARATORY COURSE—Third Year.

FALL TERM.

Rhetoric, 5.
Algebra, 3.
Physics, 2.
Latin, or German, or French, 5.
Geometry, 5.

WINTER TERM.

Rhetoric, 5.
Botany, 2.
Physics, 3.
Latin, or German, or French, 5.
Geometry, 5.

SPRING TERM.

Rhetoric, 3.
Elocution, 2.
Physics, 3.
Botany, 2.
Latin, or German, or French, 5.
Geometry, 5.

NOTE.—Each of the Natural Sciences in this course requires two hours of laboratory work weekly for each class recitation.

PREPARATORY DEPARTMENT.

This department of instruction has been extended to three years, thus placing it on a level with the Accredited High Schools of the state.

The course as it now stands provides, not only a thorough drill in the common branches, but in addition, elementary work in the natural sciences, a choice in the languages, some knowledge of manual training, and Domestic Science.

The object of this course is to prepare students for the Freshman class in College. It also furnishes a fair general knowledge to those whose circumstances will not allow taking a regular College course, and is also helpful to those qualifying themselves to teach.

A liberal course of reading is given for each year, and students are requested to cover the course as a part of their required work. It is also desirable that students purchase, as far as possible, these books, thus making them a part of their own library.

For entrance the student should be at least thirteen years of age.

Applicants will be required to pass an examination, or otherwise satisfy the Faculty of their proficiency before entering any classes.

To Parents and Students.—It is highly important that students should enter at the opening of the Fall term, as much of the year's work is based upon the principles laid down at the beginning.

Bring all textbooks, as they will be of much assistance for reference.

Mathematics.—The subject of Mathematics, embracing (1) Arithmetic, (2) Algebra, and (3) Geometry, is made practical as far as may be. Actual measurements are taken by the students, and original demonstrations, involving previous principles, are carefully brought out.

English.—The work in English includes (1) Grammar, (2) English Composition, and (3) Rhetoric. The aim of this course is to secure accurate and graceful expression, to create a taste for good literature and to afford constant exercise in composition work. In connection with this work, a classic will be made the subject of class room study, the object being to develop in the student a love for standard literature.

Elocution.—Elocution has been placed in the second and third years of this course, and will be required of all students.

Geography and History.—The subjects of Geography and History are so closely allied that they have both been placed in the first year as alternates, and are taught in connection with maps, charts and globes. Current events are taken up whenever suggested by the topic.

Spelling.—Especial attention is given to correct spelling, diacritical marks, syllabification, use and derivation of words. Careful attention is given this subject in all written work.

Reading and Literature.—The object of Reading and Literature is twofold—to learn to read, and to create a desire for good reading. Selections from standard authors are studied, and the student early learns how to use the library.

Elementary Physics.—This subject is taught almost solely by means of experiments performed by the students, only such additional instruction being given as shall be necessary to bring about a more thorough appreciation of the principles involved in the different experiments. The student is required to keep neat and complete notes on each experiment, and to answer questions intended to bring out a full understanding of the problems studied.

Human Anatomy and Physiology.—The elements of Human Anatomy, gross and microscopic. Form structure and position of organs. Dissections of common mammals before the class. The activities and functions of organs in health and disease. General principles of nutrition. exercise and sanitation.

Botany.—The elements of structural and systematic Botany are studied in the winter and spring terms, third year. The student is taught to recognize the various forms and uses of the organs of plants. An herbarium of fifty species of native plants will be required.

Drawing.—Free-hand drawing from geometric solids and casts. Study of light and shade. Clay modeling. Object drawing. Study of plant forms, with suggestions for their application to design. Memory and time drawing. Blackboard work frequently.

Horticulture.—Three periods per week in Spring term of the second year. Instruction will consist of lectures upon orcharding and small fruits, with field work in same. *Ama-*

teur Fruit Growing, by Prof. Samuel B. Green, will be used as a text-book.

Domestic Science.—A systematic course in hand and machine sewing is given during the first year, after which garment making is taken up. Each student furnishes her own material, as the garment made forms a part of her own wardrobe. Students passing a satisfactory examination in sewing will be excused.

Cooking.—The work of this course is carried on during the spring term of the second year, and is both theoretical and practical. Special attention will be given to table setting, table etiquette and serving of meals.

Students will give one dinner and one reception during the term at which they will preside as host and hostess.

Civics.—The work in this subject occupies four hours per week during the spring term of the second year, and embraces the study of the Constitution of the United States, also the study of the Montana State Constitution. Class discussion on interesting topics pertaining to the subject is encouraged. Special attention will be given to current topics.

Military Drill will be required of male students.

Graduation.—Regular graduating exercises are held in this department, and students who satisfactorily complete the Preparatory Course will be given a suitable diploma.

◆

COURSE OF READING FOR PREPARATORY DEPARTMENT.

FIRST YEAR.

Poor Richard's Almanac.
Evangeline.
Lincoln's Gettysburg Speech.
Knickerbocker's History of New York, or Sketch Book.
Memorize "Thanatopsis."
Snowbound.
Declaration of Independence.
Little Men, or Little Women.
Autocrat of the Breakfast Table.
Dicken's Child's History of England.

SECOND YEAR.

Merchant of Venice, or Julius Cæsar.
Kathrina—Holland.
Emerson's Fortunes of the Republic.
Conquest of Mexico.
Ivanhoe, Kenilworth, or Rob Roy.
Locksley Hall, or Enoch Arden.
Sesame and Lilies.
Last Days of Pompeii.
Spanish Armada—Macaulay.
David Copperfield, Oliver Twist, Pickwick Papers, or Bleak House.

THIRD YEAR.

Heroes and Hero Worship.
Emerson's Essay on Behavior.
House of Seven Gables.
Vanity Fair.
Lays of Ancient Rome.
Main Traveled Roads—Hamlin Garland.
Lectures on Architecture and Art—Ruskin.
Our Mutual Friend, or Nicholas Nickleby.
History of Literature—Carlyle.
Prince of India, or Ben Hur.

All students should read regularly one of the leading periodicals found in the College Library.

BUSINESS DEPARTMENT.

PROF. H. G. PHELPS, PRINCIPAL.
MISS STELLA E. SHAFF, ASSISTANT.

COURSE IN BOOK-KEEPING.

FALL TERM.	WINTER TERM.
Penmanship, 5.	Penmanship, 5.
Business Law and Forms, 5.	Book-keeping, 5.
Letter Writing, 5.	
Book-keeping, 5.	

SPRING TERM.

Penmanship, 5.
Book-keeping, 5.
Office Practice, 5.

Requirements for Entrance.—Students wishing to pursue this course are required to pass the examination required of those who enter the second year of the Preparatory course.

Penmanship.—The course in penmanship aims to teach a plain modern business hand. An excellent handwriting is required of every one that enters into the employ of a first-class business firm.

Business Law.—This subject is very important to any one, and especially to him who expects to engage in business, either for himself or others.

In this subject the student is taught the fundamental rules governing contracts, commercial papers, sales of personal property, bailments, insurance, interest, etc. The practical side of the subject is the drawing of all kinds of legal papers, from the simple contract to the complete organization of a corporation.

Letter Writing.—This subject is not taught by the lecture method, but instead the student is required to *write* all kinds of commercial letters and papers. The writing of these papers soon teaches proper punctuation, capitalization, and paragraphing of the different parts.

Book-keeping.—On first beginning school the student enters the Theoretical Class, Here he is taught, by means of blackboard illustrations and short sets, the simple operations in journalizing, and the mechanical work of posting, taking a trial balance, making a statement and closing the ledger.

This will occupy his time for about two weeks or more, depending on his faculty for grasping ideas.

Practical Department.—As soon as the student has gained a sufficient knowledge of the fundamental principles, he is promoted to the Practical Department. He is here given a Cash Capital and at once begins business for himself, buying and selling merchandise among his fellow students. The Ellis System, "Learn to Do by Doing," is used.

Every transaction in this work is a real one—precisely as it would be done in a business office.

Business Sections.—The main room of the Book-keeping Department is divided into three sections, viz., Section No. 1, Section No. 2, and the Chicago House. Each section is a city in itself and the students perform their transactions orally among themselves and the different offices of that section. But all business with students of the other section or the Chicago House is done by correspondence. Hence, we have intercommunication work right at home. The students of one section are entire strangers to those of the other, so far as their business dealings are concerned. By this means the student is inspired to do better work.

The two sections and Chicago House are connected by a railroad which carries the mail and freight from one section to the other.

OFFICE DEPARTMENT.

Each section is furnished with a complete set of offices, such as College National Bank, Commercial Exchange, Railroad, Postoffice, etc.

These offices are under the efficient management of the Post Graduate students for the Fall and Winter terms.

At the beginning of the Spring term, students of the Practical Department take charge of the offices, superintended by the Post Graduates, who are in constant consultation with the instructor.

At the close of the Spring term, if the work is in every way satisfactory, the student is allowed to graduate, which entitles him to take up the work of the Post Graduate Course the following year.

POST GRADUATE COURSE IN BOOK-KEEPING.

FALL TERM.

Office Management, 5.
Auditing, 5.
Penmanship, 5.
Shorthand, 5.

WINTER TERM.

Office Management, 5.
Financial Problems, 5.
Shorthand, 5.
Typewriting, 5.

SPRING TERM.

Lettering and Engrossing, 5.
Four Business Essays.
Shorthand, 5.
Typewriting, 5.

This course is designed to give the student a higher technical knowledge of Accounts. The student first learns the principles of auditing in proprietorship, partnership, and corporation book-keeping. He then takes charge of the books of students, which are out of balance or incorrectly written up or kept. This work is under the direction of the instructor.

Officers Co. A

Officers Co. B

In Financial Problems he finds much valuable work in solving problems of different degrees of complexity, winding up the affairs of partnerships, corporations and estates. Much of the course is original investigation.

Three terms of Shorthand are given, in which time he should become quite proficient as an amanuensis.

Requirements for Entrance.—Those who have completed the first year's work in book-keeping are permitted to enter and do all the work of the year.

Requirements for Graduation.—Those wishing to graduate in this course must have done the work of the three years' Preparatory Course, or its equivalent.

Upon graduation, the Degree of Master of Accounts will be conferred.

COURSE IN SHORTHAND AND TYPEWRITING.

FALL TERM.

Manual of Shorthand, 5.
Business Law and Forms, 5.
Letter Writing, 5.
Penmanship, 5.
Type-writing, 5.

WINTER TENM.

Reporter's Companion, 5.
Type-writing, 5.
Penmanship, 5.
Dictation, 5.

SPRING TERM.

Book-keeping, 5.
Dictation, 5.
Type-writing, 5.

Requirements for Entrance.—The student must have had the work of the second year of the Preparatory Course or pass an examination in the following branches:

Arithemetic, English Composition and Grammar, Elementary Algebra, Etymology, Rhetoric and Spelling.

It is very important that the student should possess a good English education, without which his services would be entirely useless to his employer.

During the year he will receive instruction in both theoretical and practical shorthand, fitting him for the duties of amanuensis, or court reporter.

The work in type-writing consists in the writing of letters, legal documents, reports, bills, contracts, envelope directing, manifolding, care of machines, etc. Much of the work in this course is done for instructors and outside persons.

Demand for Stenographers.—There is an ever increasing demand for shorthand writers. We are unable to supply the demand for students who can do first-class work.

Time Required.—Together with other branches of the course, the student's entire time and attention is required for one school year. If the student has done the work in a satisfactory manner, and has attained a speed of 100 words per minute, and can read and transcribe the same on the typewriter without hesitation, he is permitted to graduate.

◆

DEPARTMENT OF MUSIC.

PIANO.

Miss Kate Calvin.

In this course special attention is given to thorough technique, and correct interpretation with practical analysis of rhythm and form.

Selections from the following Course in Piano will be given according to the ability of the student.

Instruction in Theory and History of Music will be free to all members of the Piano Department.

Jadassohn and Emery's Harmony will be used, and those wishing to take a complete Course in Piano must pass examination in Harmony.

Frequent recitals will be given by the students for the purpose of acquiring confidence in playing at public concerts. Pupils will also receive special training in memorizing and sight-reading.

COURSE OF STUDY.

FIRST YEAR.

Fundamental Technique; selections from the five finger exercises of Louis Kohler. Melodious Exercises. Enckhausen, Book I. Duvernoy op. 176, Books 2 and 3. Czerny's Studies, revised by Germer, Book I, Part I. Selection from Easier Sonatine and Sonatas of Clementi, Kuhlau, Mozart and Haydn.

SECOND YEAR.

Daily Technique; Czerny, Germer Studies, Books 1 and 2; Major and Minor Scales. Heller op. 47, Book 2; Felix Le Couppey, op. 20 and op. 26; Loeschorn's School of Velocity, Books 1 and 2. 12 Kleine Praludien, Bach. Miscellaneous

Classics from Mozart, Haydn, Beethoven, Schumann and Mendelssohn.

THIRD YEAR.

Daily Technique; German Studies, Book 2; School of Velocity, Loeschorn, Books 2 and 3; Two Voice Inventions, J. S. Bach; Concertos, Mozart; Easier ones of Beethoven. Miscellaneous Classics; Sonatas of Hummel, Nocturns—Nos. 3 and 5, Field; Selections by Bach, Mozart, Handel, Beethoven, Schubert, Mendelssohn, Schumann, Chopin; also from Greig, Godard, Scharwenkas, Paderewski and other modern composers.

FOURTH YEAR.

Daily Technique Studies; Moscheles op. 70, op. 25; Cramer op. 84; Czerny's Virtuoso School, Book 1 op. 365; Fugues by Bach; Czerny's School for the Left Hand, op. 718; Gradus by Clementi; Concertos, Mendelssohn and Beethoven; Miscellaneous Classics; also selections from modern composers.

TUITION.

Fall Term—One lesson per week on Piano	$14.00
Winter Term—One lesson per week on Piano	12.00
Spring Term—One lesson per week on Piano	10.00
Total	$36.00
Fall Term—Two lessons per week on Piano	$25.00
Winter Term—Two lessons per week on Piano	21.60
Spring Term—Two lessons per week on Piano	18.00
	$64.80
Violin, etc., two lessons per week, per term	$24.00

Harmony.—Class lessons, $5.00 for the entire academic year.

Piano Rent.—$10.00 per year.

GENERAL INFORMATION.

FEES AND DEPOSITS.

Preparatory, or any College Course, per year	$10.00
Short Course in Agriculture, per year	5.00
Physical Apparatus (deposit)	5.00
Freshman Chemistry (deposit)	15.00
Quantitative Apparatus (deposit)	25.00
Assaying Apparatus (deposit)	30.00
Mineralogy, including Apparatus and 175 Minerals	10.00
Shop Courses (deposit per year)	5.00
Deposit for Art Work (each year)	2.00
Domestic Science, Cooking Course, per year	3.00
Botanical Laboratory, per year	2.00
Zoological Laboratory, per year	2.00

All fees and deposits must be paid in advance to the Secretary of the Faculty. Students will not be permitted to enter classes until such payments have been made.

At the end of the term the student may return such apparatus as has not been damaged and receive in return the balance of his deposit less the cost of materials.

General Expenses.—There are no dormitories connected with the College. Students can find rooms and board in private families. Good homes can be obtained at very reasonable rates. Board and room may be had for fifteen dollars per month and upwards. Students may lessen expense by forming clubs.

Students are required to board in places approved by the Faculty.

New Students.—Students intending to enter the College are requested to notify the President, or some member of the Faculty, a few days before coming to Bozeman.

Attendance.—Prompt attendance at all recitations, lectures and regular exercises of the College is required of every student.

Students whose absences exceed five per cent. of the total number of recitations or lectures, in any subject, will not be allowed to take the regular examinations in that subject without presenting a satisfactory excuse to the Faculty.

Examinations.—Frequent examinations are required of every student, so that the standing of each student may be readily ascertained at any time.

Reports are mailed to parents at the end of each term.

Special Students.—A certain amount of latitude in selecting studies will be allowed to special students, although any departure from the regular prescribed courses will be discouraged as a rule. Students desiring to take special courses must first obtain the consent of the Faculty, and their choice of subjects must be made to conform to the schedule of class work, which will be published before the beginning of each term.

Government.—Students will be expected to conduct themselves as ladies and gentlemen; those who fail to comply with this demand will be requested to leave the institution.

Students must not leave the institution without reporting to the President, either in person or by writing. Any student transgressing this rule is thereby suspended from College; he will not be readmitted another term or year, nor will any reports or grades in credit for work done here be sent to him until a satisfactory explanation is made.

LITERARY SOCIETIES.

Two successful literary societies, the Arena, and the Cliolian, exist under the auspices of the College.

They are given the benefit of the Faculty's co-operation to the fullest extent possible, one of its representatives being present at every meeting to give aid by counsel and suggestion. All students are encouraged to join one of these societies. Under this system great progress has been made.

Some of the features of the work of these societies are joint debates and literary contests.

THE COLLEGE EXPONENT.

This is a monthly journal, maintained by the students, and serves to give valuable training in English to the members of the editorial board and contributors, besides being the means of bringing the work of the College before a large body of subscribers throughout the state.

ATHLETICS.

Believing in the importance of athletics in their relations with College work, field sports and gymnasium practice are encouraged. Each year during commencement week one day is set aside for athletic contests. Great interest has centered in this day in the past, and the excellent health possessed by the students is attributable, in large part at least, to the systematic exercise taken in preparation for these events.

The arrangements for Field Day sports, for baseball and football games, including practice, are in the hands of the Athletic Association, composed of students and members of the Faculty.

LIBRARY.

The Library has about 3,300 well selected volumes and about 2,000 pamphlets. Its shelves are well supplied with the standard works of History, Science and Literature. About $1,500 is spent yearly in books and magazines.

The Reading Room is furnished with the following Journals, Periodicals and Magazines:

Agriculturist,
American Agriculturist,
American Chemical Journal,
American Dairyman,
American Electrician,
American Geologist,
American Journal of Photography,
American Journal of Science,
American Kitchen Magazine,
American Machinist.
American Veterinary Review,
Analyst,
Anatomischer Anzeiger,
Annals of Botany,
Arena,
Astronomical Journal,
Atlantic Monthly,
Berichte der Deutschen Chem. Ges.
Botanical Gazette,
Botanisches Centralblatt,
Breeders' Gazette,
Bulletin of the Torrey Bot. Club,
Cassier's Magazine,
Centralblatt fuer Bacteriologie und Parasitenkunde,
Century Magazine,
Chemical News,
Cosmopolitan,
Delineator,
Education,
Educational Review,
Electrical Engineer,
Electrical Review (N. Y.),
Electrical World.
Electrician (London),
Engineering (London),
Engineering Magazine,
Engineering Mechanics,
Engineering News,
Engineer's Magazine.
Entomological News,
Experiment Station Record,
Farm and Home,
Farming,
Field and Farm,
Forum,
Good Health,
Good Housekeeping,
Good Roads,
Harper's Bazaar.
Harper's Magazine,
Harper's Weekly,
Heating and Ventilation,
Home Journal,
Homestead.
Household News,
Irrigation Age,
Journal of Amer. Chem. Soc.,
Journal of the Inst. of Elec. Eng.,
Journal of the Mil. Serv. Inst.,
Journal of London Chem. Soc.,
Journal of Morphology,
Journal of Pedagogy,
Knowledge,
Ladies' Home Journal,
Library Journal,
Literary News,
Locomotive Engineering,
Machinery,
Monthly Weather Review,
National Stockman and Farmer,
Nature,
North American Review,
Northwestern Journal of Ed.,
Northwest Magazine,
Orange Judd Farmer,
Outing,
Patent Office Gazette,
Popular Science Monthly,
Poultry Monthly,
Power,
Proc. Amer. Assoc. Adv. Sci.,
Publishers' Weekly,
Review of Reviews,
Rural New Yorker,
School Board Journal,
School of Mines Quarterly,
Science,
Science Gossip,
Scientific American Supplement,
Scribner's Monthly,
Sound Money,
Southern State Farm Magazine,
Street Railway Review,
Sunshine,
Table Talk,
The Dial,
Transactions Amer. Inst. E. E.,

Transactions Amer. Inst. Min. E.,
Transactions Amer. Soc. C. E.,
Transactions Amer. Soc. Mech. E.,
Transactions Assoc. Eng. Socs.,
Transactions West. Soc. of Engrs.,
Veterinarian,
Veterinary Journal,
Veterinary Magazine,
Youth's Companion,
Zoologischer Anzeiger,
Zoologist.

The Reading Room is also supplied with the following daily and weekly newspapers, all of them, with two exceptions, being donated:

Avant Courier,
Big Timber Pioneer,
Belt Valley Times,
Boulder Age,
Bozeman Chronicle,
Great Falls News,
Helena Herald,
New York Times,
Northwestern Agriculturist,
Rocky Mountain Husbandman,
St. Paul Dispatch,
Stock-Growers' Journal,
The Anaconda Standard,
The Butte Miner,
The Benton River Press,
The Darby Sentinel,
The Farmers' Voice,
The Helena Independent,
The Indiana Farmer,
The Inter-Lake,
The Livingston Post,
The Madisonian,
The Mountaineer,
The Montana Fruit Grower.

DEGREES CONFERRED.

COMMENCEMENT, JUNE, 1897.

BACHELOR OF SCIENTIFIC AGRICULTURE.

E. V. Blankenship	Bozeman.

MASTER OF ACCOUNTS.

Brandley, Gertrude	Bozeman.
Ellis, Margaret	Bozeman.
Marshall, Belle	Bozeman.
Monforton, Mary	Bozeman.
Oakwood, Lottie	Bozeman.
Welch, Alice	Bozeman.

CATALOGUE OF STUDENTS, 1897-98.

THE COLLEGE.

SENIORS.

Sales, Reno H.	Bozeman.	Applied Science.

JUNIORS.

Caldwell, Thomas O.	Spring City, Tenn.	Chemistry.
Williams, Frank B.	Wickes	Mech. Engineering.

SOPHOMORES.

Cockrill, Irvine	Bozeman	Chemistry.
Freeman, Beatrice M.	Bozeman	Home Science
Gardner, Mattie J.	Bozeman	Home Science.
Maynard, Edna	Bozeman	General Science.
Titus, N. Carlisle	Miles City	Chemistry.

FRESHMEN.

Brandenburg, William	Bozeman	Mech. Engineering.
Jeffers, Bertha	Ennis	General Science.
Jeffers, Clifford	Ennis	General Science.
Koch, Elers	Bozeman	General Science.
Monforton, Zoe	Bozeman	Home Science.
Parkins, Willie E.	Belgrade	General Science.
Simons, N. Will	Spring Hill	Chemistry.
Sloan, W. Frank	Bozeman	Elect. Engineering.
Waters, Herman	Bozeman	Elect. Engineering.
Willson, Frank G.	Bozeman	Mech. Engineering.

SPECIAL.

Barbee, C. M	Bozeman	
Boyles, Ralph	Bozeman.	
Carlyle, Nannie	Toronto, Canada.	
Cook, Geneva	Bozeman.	
Cummings, Edna	Bozeman.	
Davis, Lester	Belgrade.	
Davis, Walter	Belgrade.	
Eckenbeck, Eva	Bozeman.	
Fitzgerald, James	Bozeman.	
King, Noah Ray	Bozeman.	
Lewellen, John D	Bozeman.	
Martin, Alice	Bozeman.	
Penwell, Florence	Belgrade.	
Shaw, Sadie	Bozeman.	
Stanton, Grace L	Bozeman.	
Willson, Fred F	Bozeman.	
Wisner, L. B	Bozeman.	
Wylie, Elizabeth	Bozeman	36

BUSINESS.

Arnold, James	Bozeman.
Brooks, Willie	Bozeman.
Corcoran, Bert	Bozeman.
Cowan, Flonnie	Bozeman.
Cowan, Frank	Bozeman.
Foster, Oliver E.	Bozeman.
Hagen, Joseph	Chesnut.
Ketterer, August	Bozeman.
Krieling, Anna	Bozeman.
Lansing, Gerald	Bozeman.
Lehrkind, Carl	Bozeman.
Lehrkind, Henry	Bozeman.
Lundwall, Andreas	Bozeman.
Lyon, Walter	Lewistown.
Martin, Horace	Bozeman.
Peat, John	Lima.
Reese, Evan	Bozeman.
Railey, Lizzie	Bozeman.
Sloan, Charles	Lewistown.
Smith, Jesse	Bozeman.
Walker, Mattie	Bozeman.
Walker, Zora	Bozeman.
Wiese, Ellsworth	Bozeman.
Williams, D. F	Bozeman.
Wilson, Etta	Bozeman.

ADVANCED BUSINESS.

Oakwood, Lottie	Bozeman.
Sloan, Clarence	Lewistown.
Street, Hattie	Bozeman.

STENOGRAPHY AND TYPEWRITING.

Andrews, Mae	Bozeman.	
Bryan, Blanche	Bozeman.	
Cate, Minnie	Alhambra.	
Crisman, Ethel	Pony.	
Henderson, Claude	Bozeman.	
Holloway, H. H	Milton, Iowa.	
Jones, E. B	Bozeman.	
Monforton, Mary	Bozeman.	
Ogle, Inez	Bozeman.	
Provinse, W. D	Red Lodge.	
Sheridan, Kate	Bozeman	39

SHORT COURSE IN AGRICULTURE.

Buell, H. R	Bozeman.	
Kruse, Jacob	Bozeman.	
Maynard, Bert	Bozeman.	
Melton, Eli	Belgrade.	
Rodabaugh, Walter F	Avalon, Penn	5

PREPARATORY DEPARTMENT.

THIRD YEAR.

Burke, Edmund	Bozeman.
Cameron, Jeannette	Bozeman.
Flaherty, W. A.	Cold Springs.
Foster, Carrie	Bozeman.
Jeffers, Altha	Ennis.
Jones, Wyatt W	Meyersburg.
Knadler, Willard	Belgrade.
Laycock, Blanche	Bozeman.
Millis, Scott	Red Lodge.
Moore, Ellie J.	Belgrade.
Morse, George A.	New Chicago.
Patterson, Harry C	Manhattan.
Reese, Arthur	Bozeman.
Schabarker, William	Bozeman.
Schmitt, Fred	Lewistown.
Spragg, Frank A.	Denton.
Walker, William	Hogan.
Wisner, Maude	Bozeman.

SECOND YEAR.

Arnold, Anna	Bozeman.
Austin, Hattie	Nye.
Bronner, Gertrude	Meadow Creek.
Davis, Wilbur	Belgrade.
Flaherty, C. D	Cold Springs.
Francisco, Belle	Sixteen.
Hall, Fay	Bozeman.
Harvey, Minnie	Townsend.
Holmgren, Gus	Merrill.

Jeffers, Clarence	Ennis.
Jones, Burle	Bozeman.
Kountz, John	Bozeman.
Knadler, Arthur	Belgrade.
Knadler, Edwin	Belgrade.
Miller, Nelson	Merrill.
Moore, Gertrude	Belgrade.
Seyler, John	Twin Bridges.
Seyler, William	Twin Bridges.
Stafford, Isaac	Pony.
Tavenner, Frank	Ubet.
Trent, Harley	Bozeman.
Warren, Lewis	East Helena.

FIRST YEAR.

Arnold, Ella	Bozeman.
Arnold, Louis	Bozeman.
Badgley, Ordell	Bozeman.
Bronner, Stella	Meadow Creek.
Cloninger, William	Belgrade.
Harnden, George	Cascade, Wis.
Herron, Clarence	Bozeman.
Hopkins, Belle	Melville.
Johnson, J. A.	Red Lodge.
Lay, Charlie	Bozeman.
Morris, Claude	Livingston.
Otten, Herman	Cottonwood.
Pease, Nellie	Bozeman.
Swadener, George	Bozeman.
Thompson, Charles	Bozeman.
Vogel, Jacob	Salesville.
Weaver, Thomas	Bozeman.

SPECIAL.

Armstrong, Mamie	Kansas City, Mo.
Barnett, Frances	Bozeman.
Bender, Louis V	Butte.
Bower, Mabel	Ennis.
Brassey, Edward	Lewistown.
Chavey, Millie	Bozeman.
Darlinton, George	Logan.
Dirking, Percy	Lewistown.
Friel, Hugh	Chesnut.
Hogan, Michael	Red Lodge.
Hulbert, Pearl	Bozeman.
Kircher, Michael	Miles City.
Lewellen, Lizzie	Gallop.
Luce, Laura	Bozeman.
Martin, James	Bozeman.
Maxey, David	Bozeman.
Maxey, George	Bozeman.
McDonald, Kate	Lewistown.
Monforton, John	Bozeman.
Morgan, Herbert	Duncan.
Paddock, E. E	Bozeman.

Pease, Ethel	Bozeman.	
Rhode, Fred	Miles City.	
Robinson, Lester	Bozeman.	
Sappington, Charles	Sappington.	
Sharman, S. H	Spring Hill.	
Walton, Carrey	Bozeman.	
Winters, Mrs. Mary Kay	Bozeman.	
Wylie, Fred	Bozeman.	86

MUSIC.

Alward, Coda	Bozeman.	
Anderson, Vera	Bozeman.	
Brown, Edith	Bozeman.	
Chisholm, Alice	Bozeman.	
Chisholm, Perry	Bozeman.	
Chisholm, Robert	Bozeman.	
Elliot, Kate	Bozeman.	
Fell, Ada	Bozeman.	
Flowers, Stella	Bozeman.	
Freeman, Beatrice	Bozeman.	
Gardner, Carrie	Bozeman.	
Gottschalk, Ellen	Bozeman.	
Hanson, Nina	Bozeman.	
Howard, Louis	Bozeman.	
Hills, Mamie	Bozeman.	
Hulburt, Pearl	Bozeman.	
Jeffers, Bertha	Ennis.	
Jeffers, Paul	Ennis.	
Ketterer, Susie	Bozeman.	
Luce, Gertrude	Bozeman.	
Luce, Laura	Bozeman.	
Lynde, Mrs. Ella	Bozeman.	
Martin, James	Bozeman.	
Martin, Julia	Bozeman.	
Maxey, May	Bozeman.	
Maxey, Nettie	Bozeman.	
Moore, Gertrude	Belgrade.	
Nichols, Ernestine	Bozeman.	
Nichols, Grace	Bozeman.	
Parkins, Hattie	Belgrade	
Patterson, Lois	Bozeman.	
Pease, Ethel	Bozeman.	
Robinson, Nora	Bozeman.	
Ruffner, Olla	Bozeman.	
Staats, Carrie	Bozeman.	
Stanton, Grace	Bozeman.	
Taylor, Louis	Bozeman.	
Traphagen, Gertrude	Bozeman.	
Van Allen, Janet	Bozeman.	
Willson, Fred	Bozeman.	
Work, Vida	Bozeman.	
Wylie, Grace	Bozeman.	
Yerkes, Beulah	Bozeman.	
Yerkes, Paul	Bozeman.	44

SUMMARY.

College	36
Business	25
Advanced Business	3
Stenography and Typewriting	11
Short Course in Agriculture	5
Preparatory Department	86
Music	44
Total	210
Counted twice	9
Total Enrollment	201

INDEX.

PAGE.
Accredited High Schools ... 86
Admission requirements ... 85
Agricultural Courses ... 40–48
Art, Courses in ... 29, 67
Athletics ... 103

Bacteriology, Courses in ... 32, 47
Book-keeping, Courses in ... 94–96
Botany, Courses in ... 31
Biology ... 31
Buildings ... 10
Business Department ... 94

Calendar ... 2
Catalogue of Students ... 106
Chemistry, Course in ... 54–59
College Exponent ... 103
Course of Reading, Prep. Dept ... 93
Course of Study in—
  Agriculture (Long) ... 40
  Agriculture (Winter) ... 48
  Book-keeping ... 94
  Book-keeping (Post Grad.) 96
  Chemistry ... 54
  Electrical Engineering ... 79
  General Science ... 20
  Home Science ... 62
  Mechanical Engineering .. 68
  Music ... 99
  Preparatory Department. 88
  Stenography, Typewriting 97
Crystallography ... 36

Degrees, Advanced ... 86
  Baccalaureate ... 86
Degrees Conferred, 1897 ... 106
Drawing ... 91

Economics ... 37
Electrical Engineering Course ... 79–81
Endowment ... 7
English ... 24
Equipment ... 10
Executive Board ... 4
Experiment Station ... 8
Experiment Station Staff ... 6

Faculty ... 5
Fees and Deposits ... 101
Forestry ... 34
French ... 27

PAGE.
Geology, Courses in ... 34
General Expenses ... 101
General Information ... 101
General Statement ... 9
General Science Course ... 20–25
German ... 27

History ... 7
History, Courses in ... 25
Home Science Course ... 62
Horticulture, Courses in ... 33, 91

Irrigatian, Courses in ... 46

Laboratory, Assay ... 14
  Biological ... 18
  Chemical ... 11
  Engineering ... 16
  Physical ... 11
Latin, Courses in ... 26
Library ... 103
Literature, Courses in ... 25
Literary Societies ... 102

Machine Design ... 74
Main Building ... 10
Mathematics, Courses in ... 28
Material Equipment ... 10
Mechanics, Courses in ... 49, 73
Mechanical Drawing ... 74
Mechanical Engineering Course ... 68–72
Mental and Moral Science .. 36
Military Science ... 84
Mineralogy, Collections in .. 15
Mineralogy, Course in ... 35
Music Department ... 99

Periodicals ... 105
Preparatory Department ... 89
Physics, Courses in ... 29

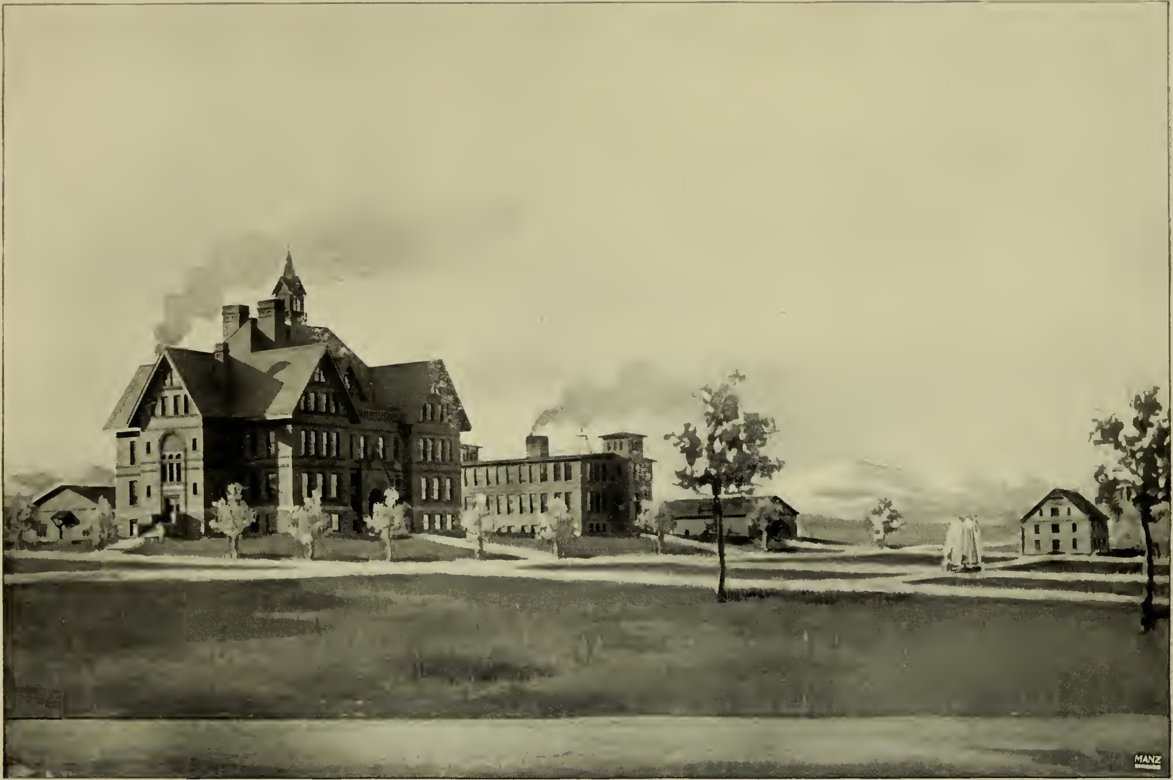
Requirements for Admiss'n 85

Shop Building ... 12
Shops, Equipment ... 15
Shop Work, Courses in ... 77
Shorthand and Typewriting 97
State Board of Education .. 3
Steam Engineering, Courses in ... 76
Surveying ... 46

Veterinary Science ... 46

Zoology, Courses in ... 32

LIBRARY
OF THE
UNIVERSITY of ILLINOIS.



General View of Buildings

SEVENTH ANNUAL CATALOG

MONTANA STATE COLLEGE

= = OF = =

AGRICULTURE

= = = AND = = =

MECHANIC ARTS,

BOZEMAN, = = = MONTANA.

FOR THE ACADEMIC YEAR 1898-99

AND ANNOUNCEMENTS

FOR 1899-1900.

BOZEMAN CHRONICLE
1899

CALENDAR FOR 1899-1900.

1899.

Registration Examinations for Entrance and Conditions	Monday and Tuesday, Sept. 11 and 12, 9 A. M.
Fall Term begins	Wednesday, Sept. 13, 9 A. M.
Thanksgiving Recess begins	Thursday, Nov. 23;
	ends Monday, Nov. 27, 9 A. M.
Fall Term closes	Friday, Dec. 22.

1900.

Winter Term begins	Monday, Jan. 8, 9 A. M.
Winter Term ends	Friday, April 6.
Spring Term begins	Monday, April 9, 9 A. M.
Annual Concert	May ——
Field Day	Friday, June 8.
Exhibition of Literary Societies	Friday, June 8.,
Baccalaureate Day	Sunday, June 10.
Oratorical Contest	Monday, June 11.
Preparatory and Business Department Graduation	Tuesday, June 12.
Commencement Day	Wednesday, June 13.

MONTANA STATE BOARD OF EDUCATION.

Governor Robert B. Smith, (ex-officio)........................Helena
Attorney General C. B. Nolan, (ex-officio)...................Helena
State Supt. of Public Instruction, E. A. Carleton, (ex-officio)..Helena

O. P. Chisholm..Bozeman
J. G. McKay...Butte
(Term expires February 1st, 1900.)
H. R. Melton..Dillon
M. J. Garrett...Lewistown
(Term expires February 1st, 1901.)
J. M. Hamilton..Missoula
H. H. Grant...Grantsdale
(Term expires February 1st, 1902.)
N. W. McConnell..Helena
O. F. Goddard..Billings
(Term expires February 1st, 1903.)

OFFICERS OF THE BOARD.

Governor Robert B. Smith,
President.

J. M. Hamilton,
Vice-President.

E. A. Carleton,
Secretary.

19Je'99 8.

EXECUTIVE BOARD,

In Charge of the College and the Experiment Station.

George Kinkel, Jr. (Term expires February 1st, 1900.)	Manhattan
Lester S. Willson (Term expires February 1st, 1901.)	Bozeman
Peter Koch (Term expires February 1st, 1902.)	Bozeman
Walter S. Hartman (Term expires February 1st, 1903.)	Bozeman
John M. Robinson (Term expires February 1st, 1903.)	Bozeman

OFFICERS OF THE BOARD.

Lester S. Willson,
President.

George Kinkel, Jr.,
Vice-President.

Peter Koch,
Secretary and Treasurer.

FACULTY.

JAMES REID, A. B.(McGill Univ.), PRESIDENT,
Professor of Mental, Moral and Political Science and Astronomy.

S. M. EMERY,
Professor of Horticulture.

FRANK W. TRAPHAGEN, PH. D. (Columbia), F. C. S.,
Professor of Physics, Chemistry and Geology.

MRS. F. E. MARSHALL,
Professor of Art.

W. H. WILLIAMS, B. E. E. (Univ. of Wisconsin),
Professor of Mechanical and Electrical Engineering.

E. V. WILCOX, PH. D. (Harvard),
Professor of Zoology and Veterinary Science.

*WILL F. BREWER, M. A. (Iowa College),
Professor of Latin and English.

AARON H. CURRIER, A. M. (Oberlin),
Professor of French and German.

....
Professor of Military Science and Tactics.

MISS LILLA A. HARKINS, M. S. (S. Dak. Agr. Col.),
Professor of Domestic Science.

ROBERT S. SHAW, B. S. A. (Ontario Agr. Col.),
Professor of Agriculture.

J. W. BLANKINSHIP, PH. D. (Harvard),
Professor of Botany.

H. G. PHELPS,
Principal of Business Department.

MISS M. A. CANTWELL,
Principal of Preparatory Department.

W. M. COBLEIGH, E. M. (College of Montana),
Instructor in Chemistry and Physics.

MISS MAY TRAVIS, A. B. (Univ. of N. Dakota),
Instructor in Mathematics.

E. B. McCORMICK, S. B. (Mass. Inst. of Tech.),
Instructor in Mechanical Engineering.

MISS HELEN R. BREWER, A. B. (Iowa College),
Instructor in Latin and History.

---

*Absent on leave, 1898-99.

MISS VIRGINIA H. CORBETT, B. L. (Ia. State Col.),
Assistant in Preparatory Department.

MISS STELLA SHAFF,
Instructor in Stenography and Typewriting.

MISS KATE CALVIN,
Piano.

MRS. MARY WINTERS,
Librarian.

LABORATORY ASSISTANTS.

ED. BURK,
Student Assistant in Chemistry.

N. W. SIMONS,
Student Assistant in Physics.

FRANK A. SPRAGG,
Student Assistant in Chemistry.

HOMER C. THOMPSON,
Student Assistant in Botany.

EXPERIMENT STATION STAFF.

S. M. EMERY, DIRECTOR,
Horticulturist.

F. W. TRAPHAGEN,
Chemist.

E. V. WILCOX,
Zoology and Veterinary Science.

J. W. BLANKINSHIP,
Botanist.

R. S. SHAW,
Agriculturist.

W. M. COBLEIGH,
Assistant Chemist.

HISTORY AND ENDOWMENT.

The College of Agriculture and Mechanic Arts is organized under an act of Congress of July 2, 1862. This act appropriated public lands to the several states for the purpose of aiding in the maintenance of Colleges:

> "where the leading object shall be, without excluding the scientific and classical studies, and including military tactics, to teach such branches of learning as are related to the Agricultural and Mechanical Arts."

The State of Montana, by an act approved Feb. 16, 1893, accepted and claimed the benefits and endowments provided under the Acts of Congress of July 2, 1862, and Aug. 30, 1890, the latter of which provides for the further endowment of these Colleges.

The income of the College is derived from the proceeds of the sale and lease of public lands donated to the State by the Federal government for the College, and which amount to 140,000 acres. An additional sum of $24,000 is appropriated for the year ending June 30, 1899, under the Morrill act of Aug. 30, 1890, to be increased $1,000 annually until it amounts to $25,000 a year. These funds with the addition of the State appropriations and the fees of students make a fairly liberal income.

Trustees.—The general control of the institution is in the hands of the State Board of Education. The direct supervision is vested in an Executive Board of five members, one of whom is appointed yearly by the Governor, subject to the approval of the State Board of Education.

THE EXPERIMENT STATION.

In connection with the College, an Agricultural Experiment Station has been established. The object of this Station is to further the interests of the agricultural industries in the State of Montana. This is done by conducting researches and experiments which may include the physiology of plants and animals; the diseases to which they are severally subject, with remedies for the same; the chemical composition of useful plants at their different stages of growth; the comparative advantages of rotative cropping as pursued under a varying series of crops; the capacity of new plants or trees for acclimation; the analysis of soils and water; the chemical composition of manures, natural or artificial, with experiments designed to test their comparative effects on crops of different kinds; the adaptation and value of grasses and forage plants; the composition and digestibility of the different kinds of food for domestic animals; the scientific and economic questions involved in the production of butter and cheese; and such other researches or experiments bearing directly on the agricultural industry of Montana as may seem advisable. For the support of this important department, the United States government appropriates yearly the sum of fifteen thousand ($15,000) dollars.

GENERAL STATEMENT.

The Montana State College of Agriculture and Mechanic Arts is the State School of Applied Science. The purpose is to give the young men and women of Montana an opportunity to acquire a good college education in Mathematics, Literature, Science and Art. The practical feature in instruction is emphasized, and while the text book, recitation and lecture are employed, the student is required to put into practice, as far as possible, the instruction he receives. This is attained by means of well equipped shops and laboratories. The work of the College is characterized throughout by the combination of the theoretical and practical.

Being a State institution, instruction is free to all residents of Montana of suitable age and acquirements. A small entrance fee is charged to cover incidentals and laboratory fees sufficient to cover the cost of material. The following departments are maintained:

The Collegiate Department, with seven four year courses leading to appropriate degrees:

I. Course in General Science.
II. Course in Agriculture.
III. Course in Biology.
IV. Course in Chemistry.
V. Course in Home Science.
VI. Course in Mechanical Engineering.
VII. Course in Electrical Engineering.

The Preparatory Department with a three year course.

The Business Department with one year courses in Bookkeeping, and Stenography and Typewriting.

The Art Department, with a four year course.

The Music Department, with a four year course.

MATERIAL EQUIPMENT.

LOCATION.

The site chosen for the College buildings and Campus is one of the most beautiful that could be imagined, being an elevation southwest of the city of Bozeman, and within the city limits. The city has been fitly named "Bozeman the Beautiful," seated as it is at the head of one of the most fertile valleys in the world, and enclosed by the peaks of the Bridger and Gallatin mountains. In the vicinity are some of the most picturesque canyons, and the botanist and geologist can nowhere find richer fields for study and observation.

In economic resources, both agricultural and mineral, and in scenic effects, nature has been most generous.

THE CAMPUS AND FARM.

The grounds and Farm contain about two hundred acres. Of this over thirty acres in the immediate vicinity of the buildings constitute the Campus and recreation grounds, sites for buildings and laboratories, the remainder being devoted to farming and experimental purposes.

BUILDINGS.

The Main Building, situated in the center of the College Campus, is a substantial structure of brick and stone, of practically fireproof construction, having a total length of

128 feet and a width of 90 feet. It is three stories high, and has a large, well lighted basement, which furnishes quarters for the Domestic Science Department and three class rooms. The first floor contains the library, four offices, and three large class rooms. The north half of the second floor is devoted to the Art Department, the arrangement being such that the three large rooms can be thrown together, by sliding doors, for exhibition purposes. The south half of this floor is fitted up entirely for the use of the business Department, the arrangement being that of the best Business Colleges. The third floor contains the large Assembly Room, a draughting room, and six laboratory and music rooms. The building is well lighted and commands a magnificent view of the Bridger and Gallatin mountains, and the whole of the beautiful Gallatin Valley. All the laboratories and offices are furnished with gas, and the whole building will be lighted with electricity from our experimental plant in the Engineering Laboratory.

The Chemical and Physical Laboratory is west of the Main building, sixty by ninety feet in dimensions. It is built of pressed brick, and has two observatory towers, one at each end, and is three stories high including the basement.

There are two entrances, one at the north end, the other at the south. A very large stack containing flues for ventilation of the hoods and furnaces passes up through the center of the building.

The basement is occupied by the laboratory of advanced physics, with desks for twelve students; and the assay laboratory arranged for eight students. In addition to these, there are rooms for the preparation of samples for analytical work, with power crushing and grinding machinery. A large room is also available for a museum.

The main floor is occupied by the office and library, a lecture room to accommodate one hundred students, a preparation room, a small class room, and the Experiment Station laboratory.

The second story contains the laboratory for elementary physics, with sufficient capacity for forty-eight students, the laboratory for physical measurements for twenty-four students, the qualitative laboratory for twenty students, the quantitative laboratory for twelve students, and the mineralogical laboratory for twelve students. The instructor's laboratory is so situated as to give him oversight of all the laboratories, and renders it easy for a student to consult with him at any time.

The north tower is used for a meteorological observatory, and a fine set of registering instruments is installed in it.

The Shop Building is a one-story frame structure, 60 by 100 feet, situated back of the Main Building, and contains a machine shop 44 by 72 feet, a forge shop 27 by 30 feet, office, tool room, wash room, engine and blower room, and boiler room. The large blower which ventilates the Main and Chemical Buildings is located here, and is connected with those buildings by undeground ducts.

The Engineering Laboratory is a two-story stone building, 33 by 52 feet, located 260 feet east of the shop building, and receives its steam supply from the main boiler through underground piping.

The Drill Hall is a one-story frame structure, 60 by 100 feet, situated between the Chemical Building and the Experiment Station, and is designed especially for military and athletic purposes.

The Experiment Station building is brick veneered, two stories high, with a large basement, and is situated on the west side of the Campus, adjoining the experiment farm. It has sixteen rooms, and contains the Biological Laboratories, the offices of the Director and the Agriculturist, and rooms for the Director's residence.

EQUIPMENT.

The Chemical Lecture Room is equipped with a porte-lumiere for use in experiments requiring projection. When cloudy weather interferes with the use of the porte-lumiere, the electric arc lamp or the oxyhydrogen lantern may be used for projection, all these instruments being arranged so as to be interchangeable.

A lecture desk extends across one end of the room, and is supplied with water, gas and electricity, with a hood which permits the making of experiments with which objectionable odors are associated.

A sufficient amount of apparatus has been secured to illustrate all of the important laws and phenomena of chemistry.

Physics.—For lecture room demonstration in physics we have a very large and carefully selected set of apparatus, with which it is possible to fully and practically illustrate the subject. An enumeration of the individual pieces would require much more space than is available in this catalogue, hence it is omitted.

Elementary Physics.—The instruction in elementary physics being given entirely by the experimental method, a considerable supply of apparatus is required. The more important pieces are: an Atwood's machine, balances and pyknometers for specific gravity determinations, spring balances for the resolution and composition of forces, air pump, Mariotte's tubes, rotating machine, siren, color discs, lenses, prisms, photometer, Holtz machine, electric batteries, galvanometers, dynamos, motors, and all the additional material required for a thorough elementary course.

Advanced Physics.—The laboratory work in Advanced Physics is that outlined in Sabine's Laboratory Course in Physical Measurements, which is Physics C of Harvard University. The course consists of a very carefully selected series of experiments. All of the apparatus necessary for this work is available, among which are micrometer callipers, a spherometer, balances, a torsion pendulum, a sonometer, a Kundt's tube, organ pipes, a Bunsen's photometer, a fine spectrometer, a magnetometer, a tangent galvanometer, a horizontal magnet D'Arsonval ballistic and dead beat galvanometer, a standard ohm, a Carhart–Clark standard cell, condenser, rheometer, Wheatstone's bridges, wire and box forms, batteries, etc.

The Assay Laboratory is provided with pulp scales for each student, five button balances, five Hoskin's crucible furnaces, large size, one number four and four number three Hoskin's muffle furnaces, one Brown's combination furnace, two power crushers, and a power grinder run by a 2 H-P. gasoline engine, a grinding plate, and a full set of samples illustrating every variation of ore in mine, mill and smelter.

The Laboratory for Qualitative Analysis, besides desks, and fume closets, has a large desk for special operations, every requisite for successful work being supplied.

In Quantitative Analysis, the students may draw from the supply room any apparatus they may desire for their work, consisting of platinum crucibles, dessicators, measuring flasks, pipettes, beakers, flasks, burettes, reagent bottles, stoves, etc.

One corner of this room is separated from the remainder by a sash partition, and serves for the balance room.

In Addition to the Standard Reference Books in science, and the principal books on its different branches, the department library contains the following complete files of scientific journals:

American Journal of Science and Arts, Journal of the American Chemical Society, Journal of Analytical and Applied Chemistry, Berzelius' Jahresbericht, Jahresbericht uber die Fortschritte der Chemie, etc., Berichte der deutschen Chemischen Gesellschaft, and many sets, more or less complete, of other journals.

This makes a reference library which is very valuable, and which will afford excellent material for aid in scientific research, covering, as it does, the progress of the science since 1820.

The Collections in mineralogy, geology and economic geology are very fine and extensive, and cover all the geological horizons.

The private collections of the professor, for many years used for the purpose of instruction, has been acquired. It is particularly rich in minerals of economic importance. The collection exhibited by Montana at the Columbian Exposition, was presented by the State to the College, and gives an excellent view of our State's mining resources. A very large amount of duplicate material is constantly being used to increase our collections through the medium of exchange.

Two sets of crystal models, and the crystalized specimens in the collection are available for instruction in crystallography.

Shops.—The equipment in this line is now complete, and consists of the latest patterns of standard machines from the best makers in the country. Before selecting this machinery, the shops of several of the most prominent engineering schools in the United States were studied, and the aim has been to make our equipment a model one. Power is furnished by one of the latest type Imperial high-speed engines, of 65 H-P., which also drives the blower.

For Woodworking, five double and three single carpenter benches are provided, making accommodations for thirteen students at a time. Each side of these benches contains two drawers with complete sets of carpenter tools, and two lockers for exercises. Twenty-six students can therefore be accommodated, each having an individual set of tools, for the care of which he is held responsible. For wood turning and pattern making there are seven speed lathes, a pattern-making lathe, a scroll saw, a double revolving rip and cross-cut saw, a variety wood-worker, and a 20-inch surface planer.

For Machine Work there are four screw cutting lathes of 16-inch swing, and one of 18-inch swing; 13-inch, 20-inch, and 28-inch drills; a universal milling machine, a 16-inch shaper, a 22-inch by 22-inch by 6-foot planer, a universal tool grinder, a cutter and reamer grinder, a polishing lathe, and a shop saw. Benches for twelve students are provided. There is also room for adding additional equipment as the needs may develop. The tool room is well supplied with small tools, and the wash room contains lockers for students' use.

The Forge Room contains ten forges. All the piping for both blast and exhaust is of tile and placed under the floor. The forges have down draft exhaust, keeping the room free from smoke and giving a very neat appearance. There is a full equipment of anvils and other necessary tools, and a power shear for cutting up stock.

The Engineering Laboratory contains, at present, a 40 H-P. Woodbury high speed engine especially designed for experimental work, a 15 H-P. vertical high speed engine, gauges, calorimeters, indicators, absorption brakes, several sizes of platform scales, tachometers, and similar ap-

Machine Shop

LIBRARY
OF THE
UNIVERSITY of ILLINOIS.

paratus for the study of steam engineering. The shop engine is also fitted up for experimental work, and a threshing engine will be added during the coming year.

For the testing of materials, there is a Riehle standard automatic and autographic screw power testing machine of 100,000 pounds capacity with auxiliary instruments, fitted up also for beam testing; an Olsen torsion testing machine capable of breaking a specimen 1½ in. by 5 ft.; and a Fairbank's cement testing machine.

For electrical work, the College owns two specially designed multipolar dynamos, each of 15 K-W. capacity at 125 volts. They can also develop 225 volts, and are arranged with commutator at one end and 6 collector rings at the other, so as to give one, two and three phase alternating currents. The two machines thus give a large number of combinations. Besides these, there is a 6 K-W. bipolar dynamo, a 15 light arc dynamo, and a good supply of rheostats, lamps, voltmeters, ammeters and wattmeters of the latest patterns. Some new machines will be added the coming year, besides transformers, recording wattmeters, etc., making the equipment complete and thoroughly up to modern standards.

For the study of steam boilers the 85 H-P. return tubular boiler in the shop building is available, and also the 25 H-P. boiler in the Experiment Station. Apparatus is provided for measuring feed water, fuel, and everything necessary for complete boiler tests.

Surveying Instruments.—In this line the College has two transits, one with solar attachment; two levels, a field compass, a plane table, a sextant, and chains, tapes, and rods of various kinds.

Water Measuring Instruments include three current meters, two automatic recording water registers, test weirs, and other auxiliary apparatus.

The Art Department has a good equipment of casts in busts, masks, parts of the human figure, ornament, and geometric solids; benches and tools for wood carving and clay modeling; photographic copies of sculptures and world pictures.

The Kitchen Laboratory is a large room provided with cupboards, and conveniently furnished with tables, sinks, range, an Aladdin oven, and a good supply of cooking utensils of all kinds. Individual work tables are provided for the use of each student. These tables have a full equipment of cooking utensils.

Opening from the kitchen is a dining room, with sideboard well supplied with table linen, dishes and silver.

The Sewing Room is furnished with a large cutting table, small sewing tables, three sewing machines, and cases for work. This handsome and spacious apartment is also used for reception purposes.

The Botanical Laboratories on the two upper floors of the Experiment Station Building are fitted for the accommodation of about 34 students. The apparatus available for work in this department consists of nine compound microscopes, two of which have all modern accessories for high-power work; stage and eye-piece micrometers, a Wollaston and an Abbe camera lucida, a sliding microtome, paraffine and water baths, 26 dissecting microscopes, with the necessary stains, reagents, etc., required for histological, morphological and systematic botany. There are also hot-air and steam sterilizers, an incubator, a Wulfhuegel counting apparatus and the other accessories needed for bacteriological work.

The Herbarium now contains 2,000 sheets of Montana species, 700 from Wyoming and about 1,500 mounted Phanerogams from other parts of the United States. There have also been secured sets of Cummings, Williams, and Seymour's *Lichenes Boreali Americani* (250 specimens), Renauld & Cardot's *Musci europæi exsiccati* (200 specimens), Collins, Holden and Setchell's *Phycotheca Boreali Americana* (550 specimens), Seymour & Earle's *Economic Fungi* (500 specimens), and a private collection of American *Characeæ* (about 400 specimens). In addition students have access to the private collection of the professor, containing about 6,000 specimens, thus giving a reference herbarium of over 12,000 specimens, in nearly every department of botany. A large collection of duplicates afford abundant material for students in advanced systematic work, and the conservatory on the Experimental Farm will furnish fresh botanical material for use during the winter months.

The departmental library, including private works accessible, now contains about 400 volumes and as many pamphlets, comprising nearly all the important recent works on American botany and is particularly good in that relating to the Rocky Mountain region. Books needed for students doing special work will be purchased as required.

The Zoological Laboratories occupy rooms adjacent to the botanical and can accommodate about 28 students. The apparatus comprises eight compound microscopes, one fitted with iris diaphragm, condenser, and immersion lens for more detailed work; stage and eye-piece micrometers, an Abbe camera lucida, an automatic microtome, hæmacytometer, paraffine bath, dissecting instruments, etc.; a set of 32 wall charts and of anatomical models for illustrative purposes, a human skeleton, alcoholic material of the various groups of animals for class use and the nucleus of a collection in entomology.

THE GENERAL SCIENCE COURSE.

This course may be considered as representing the general educational work of the College. It is arranged so as to meet the wants of those who seek to obtain a liberal and practical education through the study of the Mathematical, Physical, Natural and Economic sciences, and Latin or the Modern Languages and Literature. It provides a thorough training in Mathematics and Physics and in the natural sciences, Biology, Chemistry, Botany, Geology; also in the study of Mental, Moral and Political Science. It includes a liberal course in History, the English Language and Literature. The design is that any student completing the course shall be thoroughly equipped for the duties of life and fitted to enter successfully upon any chosen career.

The Fall term, Freshman year, is the same for all College courses. The Winter and Spring terms are the same for all College courses, except the Engineering.

SCHEDULE OF

THE GENERAL SCIENCE COURSE.

FRESHMAN YEAR.

(Figures indicate the number of recitations or the actual hours of practice per week. Figures in parenthesis indicate the number of the sub-course.)

Fall Term.

MATHEMATICS,	5:	Higher Algebra.
LANGUAGE,	6:	Latin, or German, or French, 4. Rhetoric, 2.
CHEMISTRY (1),	4:	Lectures on the non-metals, 3, Recitation, 1.
DOMESTIC SCIENCE,	3:	Lectures on Household Economy and Sanitation, —for women.
Practicums,	19:	Freehand Drawing, 3½. Mechanical Drawing, 3½,—for men. Shop Work, 6, for men.—Additional freehand drawing for women. Chemistry (2), 6.

Winter Term.

MATHEMATICS,	5:	Higher Algebra, 3. Plane Trigonometry, 2.
LANGUAGE,	6:	Latin, or German, or French, 4. Rhetoric, 2.
CHEMISTRY (1),	4:	Lectures on the Metals, 3, Recitation, 1.
BOTANY (2),	2:	Morphology of Cryptogams.
Practicums,	19:	*Mechanical or Freehand Drawing, 7, for men, or Cooking, 7, for women. Botany (2), 6. Chemistry (3), 6.

Spring Term.

MATHEMATICS,	5:	Trigonometry.
LANGUAGE,	6:	Latin, or German, or French, 4. Rhetoric, 2.
CHEMISTRY (1),	4:	Lectures on the Metals, 3, Recitation, 1.
ZOOLOGY (1),	2:	General Zoology.
Practicums,	18:	Art, 6. Zoology (1), 6. Chemistry (4), 6.

---

*Students intending to take the Chemical Course should take Mechanical Drawing.

GENERAL SCIENCE COURSE. SOPHOMORE YEAR.

Fall Term.

Language, 5: *Latin, or French. 3.
American Literature, 2.
History. 3: The Athenian Empire.
†Electives, 13 to 18: Two of the following:
- Analytic Geometry, 5.
- Greek, 3.
- Chemistry (11), Lectures, 3, Laboratory (5), 6.
- Physics (1), Lectures, 3, Laboratory (2), 6.
- Botany (3), Lectures, 2, Laboratory, 6.
- Zoology (2), Lectures, 2, Laboratory, 6.
- Domestic Science, Lectures, 2, Laboratory, 6.
- Art, Lectures, 2, Laboratory, 6.

Winter Term.

Language, 5: *Latin, or French, 3.
American Literature, 2.
History. 3: The Athenian Empire.
†Electives, 13 to 18: Two of the following:
- Calculus. 5.
- Greek, 3.
- Pedagogy, 5.
- Chemistry (12), Lectures, 3, Laboratory (7), 6.
- Physics (1), Lectures, 3, Laboratory (2), 6.
- ‡Botany (4), Lectures, 2, Laboratory, 6.
- Zoology (2), Lectures, 2, Laboratory, 6,
- Domestic Science, Lectures, 2, Laboratory, 6.
- Art, Lectures, 2, Laboratory, 6.

Spring Term.

Language, 5: *Latin, or French, 3.
Shakespeare, 2.
History, 3: The Roman Republic.
†Electives, 13 to 18: Two of the following:
- Calculus, 5.
- Greek, 3.
- Horticulture, 5.
- Chemistry (13), Lectures, 3, Laboratory (7), 6.
- Physics (1), Lectures, 3, Laboratory (2), 6.
- Botany (5), Lectures, 2, Laboratory, 6.
- Zoology (2), Lectures, 2, Laboratory, 6.
- Domestic Science, Lectures 2, Laboratory, 6.
- Art, Lectures, 2, Laboratory, 6.

---

*Required of those who have not taken German. Students who have completed Freshman German must take three electives.

†No class will be formed in any elective subject for less than three students, except at the option of the instructor.

‡Not given 1899-1900.

GENERAL SCIENCE COURSE. JUNIOR YEAR.

Fall Term.

Language, 2: English Literature.
Civics, 3: Constitutional History.
Science, 3: Astronomy.
Electives, 16 to 18: Two of the following:
- Physics (3), Lectures, 3, Laboratory (4), 6.
- Chemistry (10), Lectures, 3, Laboratory, 6.
- Botany (6), Lectures, 2, Laboratory, 6.
- Zoology (3), Lectures, 2, Laboratory, 6.
- Art, Lectures 2, Laboratory, 6.
- History, Lectures, 3, Library, 4.
- Surveying, Lectures, 2, Field, 6.

Winter Term.

Language, 2: English Literature.
Civics, 3: Constitutional Law.
Mental Science, 3: Elements of Logic.
Zoology (4), 3: Human Physiology.
Electives, 16 to 18: Two of the following:
- Physics (3), Lectures, 3, Laboratory (4), 6.
- Chemistry (10), Lectures, 3, Laboratory, 6.
- Botany (7), Lectures, 2, Laboratory, 4.
- Art, Lectures, 2, Laboratory, 6.
- History, Lectures, 3, Library, 4.

Spring Term.

Language, 2: English Literature.
Economics, 5: Principles of Political Economy.
Zoology (4), 3: Human Physiology.
Electives, 16 to 18: Two of the following:
- History of Philosophy, 5.
- Landscape Gardening, 5.
- Physics (3), Lectures, 3, Laboratory (4), 6.
- Chemistry (10), Lectures, 3, Laboratory, 6.
- Botany (8), Lectures, 2, Laboratory, 6.
- Zoology (5), Lectures, 2, Laboratory, 6.
- Art, Lectures, 2, Laboratory, 6.
- History, Lectures, 3, Library, 4.

GENERAL SCIENCE COURSE.—SENIOR YEAR.

Fall Term.

PHILOSOPHY,	5:	Psychology.
GEOLOGY,	5:	Dynamical and Structural.
POLITICAL SCIENCE,	5:	International Law.
THESIS WORK,	10:	In assigned subject.
ELECTIVES,	2 to 8:	One or two of the following:
		Mineralogy and Crystallography, 6.
		English Literature, 2.

Winter Term.

GEOLOGY,	5:	Historical.
SOCIAL SCIENCE,	5:	Sociology.
THESIS,	15:	
ELECTIVES,	2 to 11:	One or two of the following:
		Lithology, 6.
		Psychology, 5.
		English Literature, 2.

Spring Term.

MORAL SCIENCE,	5:	Principles of Ethics.
THESIS,	20:	
OPTIONAL,	3:	Economic Geology.

ENGLISH.

PROF. BREWER.

1. ***Rhetoric.***—This work is a further application of the principles learned in the Preparatory course. A little time is spent in the development of theory, but for the most part the course consists in actual practice in the different types of English prose composition, exposition, argumentation, description, and narration. Themes are prepared frequently and read and criticised before the class. Models are set from the English masterpieces for imitation. Work poorly done is rewritten by the student, in accordance with the suggestions of the instructor. The course is intended to form a sufficient preparation for the written work required frequently in most subjects throughout the course.

2. ***American Literature.***—The first formal literary course in the College is the study of American Literature, which takes two hours a week during the fall and winter terms of the Sophomore year. No textbook is used, the work being altogether lectures, with outside reading, and written and oral reports. The library is fairly well equipped with the necessary material, which is constantly being increased.

3. ***Shakespeare.***—The spring term of the Sophomore year is devoted to Shakespeare, at least one play being read critically in class. All students are expected to be able to read aloud intelligently and intelligibly, and such reading is considered a part of the interpretation. Lectures and written reports form a part of the work.

4. ***English Literature.***—In the Junior year the subject of the course is some period of English literature since Shakespeare. The methods of work are the same as in the course in American literature described above. The period treated will vary from year to year to furnish an elective course for the Seniors.

In the Senior year the work is similar in character to the work already described in the Junior year. The subject of the course will be changed from year to year, and the Seniors will recite with the Juniors.

HISTORY.

MISS BREWER.

1. ***Greek and Roman.***—The student is expected to have had a preparatory course which has given him some knowledge of the great epochs in history and their relations to each other. Therefore in the Sophomore work he will take up the thorough study of special important periods. By the use of such sources as are available in translations of Greek and Latin authors the student will be encouraged to form his own opinions. In this connection he will be given practice in the application of the fundamental principles used in testing the value of historical material. The work will not be confined to this line but standard historians will be consulted on the subjects pursued.

2. ***Modern.***—The same methods used in Greek and Roman history will be employed in this subject.

3. ***Constitutional History.***—The fall term of the Junior year is given to the study of the English constitution and its history. The knowledge acquired in the earlier historical courses furnishes much material for comparison. The course is a valuable, though not a necessary, introduction to the study in the winter term of the American constitution in its history, its theory, and its actual working. Both these courses consist mainly of reading and reports with occasional lectures.

LATIN.

PROF. BREWER.

1. ***Cicero.***—The four orations against Catiline are read, and three others. Work in prose composition is required during a part of this time. Roman politics, as compared with those of our own day, always interest students who have an intelligent interest in current events, and there is every opportunity for such comparative study in this course.

2. ***Livy and Horace.***—The special aim in this year's work, as in the previous course, is to enable the student to

acquire facility in reading and to instruct him in the use of Latin texts as a means of acquiring knowledge of the public and private life of the Romans; but grammatical study and literary criticism will not be neglected.

NOTE:—As an elective, Greek has been introduced, and a class will be formed if there are a sufficient number who wish this subject.

MODERN LANGUAGES.

PROF. CURRIER.

FRENCH.

The study of French is begun in the Freshman year, and the first year's work includes thorough study of the elements of grammar, careful reading with translation of three hundred pages or more of easy French, composition, practice in pronunciation and oral reading. Fair facility in sight reading is expected at the close of the year.

In the Sophomore year, in addition to easy texts, further study of grammar and composition, specimens of the classics, prose and poetry, will be read, and also some scientific French, thus cultivating in the student an appreciation of the best foreign literature. The chief aim of the course is acquisition of practical reading knowledge.

GERMAN.

The Freshman work in German is a continuation of the course offered in Preparatory Department and can be taken only by students who have had two years of German previously. Scientific texts will be read in addition to the classics and special attention will be paid to composition.

MATHEMATICS.

MISS TRAVIS.

1. ***Higher Algebra.***—Beginning with a thorough review of radicals, quadratics, ratio and proportion, the course

covers variation and progression, binomial theorem, convergency, divergency, and summation of series, undetermined coefficients, logarithms, permutations and combinations, and continued fractions. Text-book: Wells' College Algebra.

2. ***Trigonometry.***—A thorough course in plane trigonometry, much time being given to the solution of triangles on account of its great practical importance in further technical work. Text-book: Wells' New Plane Trigonometry.

3. ***Analytic Geometry.***—Straight lines and conic sections, and an introduction to geometry of three dimensions. Text-book: Nichols' Analytic Geometry.

4. ***Calculus.***—The work will be made as practical and concrete as possible. The integral calculus will be introduced early in the course and taught consecutively with the differential. Text-book: Hall's Calculus.

CHEMISTRY AND PHYSICS.

DR. TRAPHAGEN AND MR. COBLEIGH.

(For description of sub-courses, see Course in Chemistry.)

1, 2. ***General Chemistry.***—Lectures and laboratory work.

3. ***Qualitative Analysis.***

4. ***Blowpipe Analysis.***

5. ***Quantitative Analysis.***

7. ***Organic Chemistry.***

10. ***Chemical Analysis.***

Any sub-course in chemistry given in Chemical Course may be taken for elective work, provided the student selecting such work has a sufficient preparation.

Physics, 1.—The lectures in physics are designed to render the student familiar with modern theories. The work is largely experimental, a fine set of physical apparatus made for us by Max Kohl of Chemnitz, Germany, making it possible to illustrate by attractive experiments many of the phenomena of this science. Atkinson's Ganot is used as a reference book.

Physical Measurements, 2.—This work is that outlined in Sabine's Manual of Physical Measurements and consists of a series of very carefully selected experiments in physics. It constitutes course C of Harvard University.

Physics, 3.—Junior elective consisting of courses of lectures extending the work of preceding years. Divided as far as possible so as to offer complete courses for each term.

Physics, 4.—Laboratory work to accompany preceding. An extension of Physies 2, designed to meet the needs of the individual student, and to place him in a position to pursue research work in connection with his thesis.

ART COURSE.

MRS. MARSHALL.

The Art Course, as here outlined, will indicate the work of the average student in the various departments of College work.

This department also provides a regular four years' course for those who attend mainly for the art work.

All the teaching being individual, the student is carried forward just as rapidly as his own talent and industry will permit.

Every effort is made to teach correct drawing. The pupil is then encouraged to apply such knowledge in any direction in which his talents may seem to lie, and is allowed the use of various mediums, such as oil, water color, pastel, etc., and also can take lessons in China painting.

The classes in drawing and wood carving are open to students in any of the College courses.

All the work done must be returned for the annual Art Exhibition.

FRESHMAN YEAR.

Drawing from the cast, in charcoal and crayon. Still life and object drawing. Drawing from plants and other natural forms in preparation for design. Sketching from nature, during the last few weeks of the spring term.

In object drawing the pupil is required to study artistic grouping and good arrangement of light and shade. Memory and time drawing and blackboard work will be carried through the year.

Perspective, and its practical application to the drawing of buildings and to sketching from nature. Perspective problems to be worked out and carefully drawn. Water color tinting for Mechanical work.

Two art lectures a week.

Clay modeling and wood-carving may be studied at the discretion of the teacher.

SOPHOMORE YEAR.

General Principles of Design.—Color schemes and color harmony. Historic ornament.

Each student will occasionally be required to submit original designs for embroidery, wood-carving and other decorative work, based upon plant forms which he has drawn during previous years.

Painting of plants and still life in oil or water color.

Pen and ink drawing.

Sketching from nature as the weather will permit.

JUNIOR YEAR.

Wood Carving.—An extended course in carving as applied to furniture and other objects.

Lectures on the history of wood carving.

Figure Study.—In this year there is a life class, open to all who show talent for figure drawing. Study of costume. Painting in oil and water color. Lectures on decoration of interiors.

SENIOR YEAR.

Any branch of art preferred by the student. Otherwise further instruction in branches already begun by the student. China painting, if desired.

BOTANY.

DR. BLANKINSHIP.

[For detailed description see "Course in Biology."]

2. ***Morphology of Cryptogams.***
3. ***Histology.***
4. ***Bacteriology*** (alternates with 7).
5. ***Physiology.***
6. ***Systematic Botany.***
7. ***Economic Botany*** (alternates with 4).
8. ***Ecology.***

Except 4 and 7, the courses must be taken in order given.

ZOOLOGY.

DR. WILCOX.

[For detailed description see "Course in Biology."]

1. ***General Zoology.***
2. ***Comparative Anatomy*** (3 terms).
3. ***Entomology.***
4. ***Human Physiology*** (2 terms).
5. ***Embryology and Microscopic Technique.***

Except 3 and 4, the courses must be taken in the order given.

GEOLOGY.

DR. TRAPHAGEN.

Lectures in connection with the use of Le Conte's Elements of Geology, as a text, occupy the entire year. The work is divided into Physical, Structural and Historical Geology, and includes practice in the indentification of the age of rocks by fossils, stratigraphical work in the field, and identification of the crystalline rocks by microscopical examination.

The fact that the Livingston and Three Forks folios, just issued by the United States Geological Survey, cover the region immediately surrounding us, shows how favorably we are situated for field work in geology under the best conditions.

We have within a few miles of the College, not only stratified rocks covering great ranges of geological time, but we have also many of the eruptives, which have been carefully studied and described by expert geologists.

Economic Geology is treated by lectures under the following general headings: Ore Deposits: Classification, Genesis, Occurrence; Coals, Petroleum and Natural Gas; Building Stone; Abrasive Materials; Natural Salts; Gems; Limes, Cement and Artificial Stones; Pigments; Water; Phosphates; Clays used for Pottery, Porcelain, etc.; Sands for Glass; Soils and Miscellaneous Topics.

Mineralogy.—Lectures upon Mineralogy are given, and in conferences the attention of the student is directed to the characteristics of each of the minerals whose identification is required, its resemblance to other minerals and its differences. The lectures deal with all those properties which can be distinguished without apparatus, the chemical composition and tests being only incidentally treated. Later, in Determinative Mineralogy, unknown minerals are given, and by the application of the chemical tests of blowpipe analysis, and his knowledge of Theoretical Mineralogy and of Crystallography, the student identifies the specimens.

The specimens used in this course consist of a large collection, illustrating the minerals of economic importance and their associates. The students also have access to the very extensive collections of the College.

Crystallography.—Crystallography is taught by aid of a set of models which illustrate the more important crystalline forms and their modifications. They cover all the forms of which a knowledge is necessary for the student of Mineralogy, and the student becomes thoroughly familiar with each of them.

ART ROOM

MENTAL AND MORAL SCIENCE.

PRES. REID.

The work in this department aims to introduce the student to an acquaintance with the nomenclature, definitions, methods, problems and aims of philosophical study. The transition by the young student from studies mainly objective, to studies chiefly reflective and subjective, is often to the average student, a difficult and unwelcome experience. Any course of preliminary instruction, therefore, calculated to smooth the way for this transition by familiarizing the student's thought with the terms, definitions, method and easier problems, must be as valuable as welcome to the student. Suitable elementary texts in Logic, Psychology and Ethics will be chosen to perform this important office, supplemented by a course of lectures especially prepared as an introduction to a more comprehensive study of Philosophy. The History of Philosophy will be studied during the spring term of the Junior year.

Logic.—The work in this subject will occupy the winter term of the Junior year. Of the value of the study of Logic, both as a mental gymnastic and as a special training of the faculties for the discovery of truth and the detection of error, nothing need be urged.

Our method of instruction includes thorough study of the text book and a practical application of the principles of Logic to the student's habits of thinking and expression, and to the detection of logical fallacies in examples chosen from standard literature.

Psychology.—The fall term of the Senior year is devoted to this study. Careful attention will be given to the double aspect of this science, approaching it from the standpoints of consciousness and physiology. Class discussion and debate on the many interesting and practical questions that constantly present themselves in pursuing this study will be encouraged, and thesis work assigned to develop such questions more fully. The study may be carried on as an elective throughout the year.

Economics and Sociology.—The principles of Political Economy are taken up in the spring term of the Junior year and consist of a course in general economic theory based upon Ely and Walker. The subjects of Money and Banking, Taxation, Rent, Socialism and the Labor Problem are discussed.

The work in Sociology is carried on during the winter term of the Senior year. The origin and history of human society, the various social phenomena, and the laws controlling human intercourse will be treated.

The general theory of Sociology is taken up and studied by means of text book and discussions.

Ethics.—During the last term of the Senior year the study of Ethics is taken up and is carried on daily throughout the term. The various ethical theories are discussed, for which the student is prepared by his studies in the History of Philosophy and Psychology.

Astronomy.—This study occupies the fall term of the Junior year, and includes the study of the celestial sphere, astronomical instruments, the solar system, eclipses, the stars, etc.

DOMESTIC SCIENCE.

Miss Harkins.

Household Sanitation.—Lectures pertaining to the proper care of the home and its inmates.

Cooking.—The work in cooking is both theoretical and practical. The object of the work is to familiarize the student with the most systematic, economical, healthful and attractive methods of preparing and serving foods. Special attention is given to table-laying and decorations, and to serving of meals.

Students taking Domestic Science in the Sophomore year of the general science course have a choice of sewing or cooking.

Mechanical Drawing.—The use of instruments, elementary projections, free-hand sketching of objects from which complete drawings are made. Mr. McCormick.

Shop Work.—The use and care of tools, exercises on the most common splices and joints, rabbeting, gaining, and plowing. Each new exercise will be preceded by lectures. The course is designed to give students such training in the use of tools as will be of most value to them in their future work. Prof. Williams.

Surveying,—Only the elements of plane surveying are taught, including the use of the compass, transit, level, chain and rods; all adjustments of instruments; surveying of fields, establishing of corners, running of levels, triangulation, computation of areas and earthwork. Class room and field work. Prof. ———

Pedagogy.—The work in this subject is elective, five hours per week during the Sophomore year. The work of this course includes a study of the prominent educators, and discussions of the principles advocated by them as related to the modern methods of education. Miss Cantwell.

THE COURSE IN AGRICULTURE.

PROF. SHAW AND DIRECTOR EMERY.

The aim of this course is to give young men a general scientific education, to thoroughly instruct them in the relations of science to the various branches of Agriculture, and to supply the mental training necessary to successful investigators or practical agriculturists.

The student is taught the application of the principal branches of physical and natural science to the business of farming, and is afforded a thorough knowledge of its principles and practices. Instruction is given in regard to the nature of soils, the reason for, and the best methods of cultivation; the application of water to growing vegetation, and the action of irrigation waters upon the soil and crop; the constituents and characteristics of plants and animals, and the conditions necessary for their perfect development.

The student's time is not consumed in manual labor, except where special skill is required in the performance of some particular work. His time is fully occupied in the instruction in class room, laboratory, field and shop. No pains are spared to give a high degree of intellectual training and special preparation for the business of farming.

The general studies of the course include Mathematics, English, History, Literature, and the principles of the general sciences. The direct application of these sciences is brought out early in the course, and as the student advances in mental training he is given more difficult work. During the Senior year he is assigned subjects for original investigation. For a description of general studies see the General Science Course.

SCHEDULE OF

AGRICULTURAL COURSE.

FRESHMAN YEAR.

The same as in General Science Course.

(Figures indicate the number of recitations or the actual hours of practice per week. Figures in parenthesis indicate the number of sub-course.)

SOPHOMORE YEAR.

Fall Term.

LANGUAGE,	5:	*Latin, or French, 3.
		American Literature, 2.
CHEMISTRY (5),	3:	Quantitative Analysis.
HISTORY,	3:	The Athenian Empire.
AGRICULTURE,	3:	Soils.
Practicum,	6:	Chemistry.
†ELECTIVE,	8 or 9:	One of the following:
		Physics (1), Lectures, 3, Laboratory (2), 6.
		Botany (3), Lectures, 2, Laboratory, 6.
		Zoology (2), Lectures, 2, Laboratory, 6.

Winter Term.

LANGUAGE,	5:	Latin, or French, 3.
		American Literature, 2.
CHEMISTRY (7),	3:	Quantitative Analysis.
HISTORY,	3:	The Athenian Empire.
AGRICULTURE,	3:	Crops and Fertilizers.
Practicum,	6:	Chemistry.
ELECTIVE,	8 or 9:	One of the following:
		Physics (1), Lectures, 3, Laboratory (2), 6.
		Botany (4), Lectures, 2, Laboratory, 6.
		Zoology (2), Lectures, 2, Laboratory, 6.

Spring Term.

LANGUAGE,	5:	Latin, or French, 3.
		Shakespeare, 2.
CHEMISTRY (7),	3:	Quantitative Analysis,
HISTORY,	3:	The Roman Republic.
HORTICULTURE,	5:	
Practicum,	6:	Chemistry.
ELECTIVE,	8 or 9:	One of the following:
		Physics (1), Lectures, 3, Laboratory (2), 6.
		Botany (5), Lectures, 2, Laboratory, 6.
		Zoology (2), Lectures, 2, Laboratory, 6.

---

*, †, See notes under Sophomore Year, General Science Course.

AGRICULTURAL COURSE.—JUNIOR YEAR.

Fall Term.

Language,	2:	English Literature.
Civics.	3:	Constitutional History.
Surveying.	2:	Lectures.
Science.	3:	Astronomy.
Agriculture,	5:	Breeds and Breeding.
Practicum,	6:	Field Work in Surveying.
Elective.	8 or 9:	One of the following:
		Chemistry (10), Lectures, 3, Laboratory, 6.
		Botany (6), Lectures, 2, Laboratory, 6.
		Zoology (3), Lectures, 2, Laboratory. 6.

Winter Term.

Language,	2:	English Literature.
Civics.	3:	Constitutional Law.
Agriculture,	4:	Feeds and Feeding.
Biology,	6:	Human Physiology, 3.
		Veterinary Anatomy, 3.
Practicum,	9:	Forge Work.
Elective,	8 or 9:	One of the following:
		Chemistry (10), Lectures, 3, Laboratory, 6.
		Botany (7), Lectures, 2, Laboratory, 6.
		Zoology, (3), Lectures, 2, Laboratory, 6.

Spring Term.

Language,	2:	English Literature.
Economics,	5:	Principles of Political Economy.
Agriculture,	5:	Landscape Gardening.
Biology,	7:	Human Physiology, 3.
		Veterinary Medicines, 4.
Elective,	8 or 9:	One of the following:
		Chemistry (10), Lectures, 3, Laboratory, 6.
		Botany (8), Lectures, 2, Laboratory, 6.
		Zoology (5), Lectures, 2, Laboratory, 6.

AGRICULTURAL COURSE.—SENIOR YEAR.

Fall Term.

Philosophy,	5:	Psychology.
Geology,	5:	Dynamical and Structural.
Biology,	3:	Animal Nutrition.
Agriculture,	6:	Irrigation, 3. Dairying. 3.
Practicum,	9:	Dairying.

Winter Term.

Social Science,	5:	Sociology.
Geology,	5:	Historical.
Biology,	3:	Diseases of Animals.
Mechanics,	3:	Practical Steam Engineering.
Thesis,	15:	
Practicum,	6:	Engineering Laboratory.

Spring Term.

Moral Science,	5:	Principles of Ethics.
Geology,	3:	Economic.
Agriculture,	3:	History of Agriculture.
Thesis,	20:	

DESCRIPTION OF SUB-COURSES.

Soils, Crops and Fertilizers.—Kinds of soils, their source, physical properties, cultivation. History of our common crops, their development, production, uses, characteristics. Action of fertilizers; potash, nitrogen and phosphorus; their adaptability to general and special crops; green manuring, artificial manures, maintenance of fertility of soils.

Dairy Husbandry.—Adaptability to certain sections; small dairies and creameries; testing of milk; butter and cheese making; breeds of dairy animals; rearing, feeding and management. Both lectures and practical work.

Breeds and Breeding.—Different breeds of live stock, their source, breeding and development; pedigrees, their value and manner of keeping; principles of stock breeding, atavism, heredity, selection, control of sex, inbreeding, linebreeding, crossing, parental and climatic influences; care and management of breeding animals.

Feeding of Animals.—Constituents of foods, and of the animal body, their relation to each other; digestion, assimilation and waste; feeding stuffs, varieties, preparation, by-products, composition, digestibility, nutritive ratios; harvesting of fodders, hay making, ensilage, roots; soaking and grinding of food; feeding for special purposes, calculation of ratios; feeding standards, maintenance ration; feeding for beef, mutton, pork; feeding the working animal; feeding for milk and butter, for muscle power; effects of breeds; individuality of animals; influence of various foods.

Irrigation.—This subject is of special importance and great value in the Rocky Mountain regions, where successful agriculture depends upon the application of water to crops by artificial means.

The object is to give students a thorough knowledge of the irrigation laws of Montana, construction and maintenance of ditches, headgates, measuring devices, miner's inch and cubic foot systems of measurement.

Action of water on soils and crops; irrigation appliances and devices; measurement, division and duty of water; method of application to various soils, drainage, seepage from ditches; amount of water returning to rivers which may be again used in irrigation; formation of ditch companies and their methods of management.

Surveying.—The same as in General Science Course.

VETERINARY SCIENCE.

1. ***Veterinary Anatomy.***—Both special and comparative anatomy of the domestic animals. Laboratory work will consist of dissections of the various domesticated animals.

2. ***Veterinary Medicines.***—Nature, uses, effects, doses, and applications of the various drugs used in veterinary practice. General preventive measures and animal sanitation. Care and use of domestic animals.

3. ***Animal Nutrition.***—Value, uses and effects of the common fodder plants. Comparative animal physiology. Functions of the various organs in the digestion of foods. Assimilation and excretion.

4. ***Diseases of Animals.***—Special, general and contagious diseases of animals. Pathological physiology and anatomy of organs. Diagnosis, surgical and medical treatment of diseases.

Agricultural Chemistry and Physics.—Lectures upon the origin, composition and physical properties of soils and the conservation of plant food and moisture. The composition of animal and vegetable tissues and principles of nutrition. Manufacture and use of fertilizers, etc.

Chemistry.—The course in Chemistry contains a description of the work in general chemistry, laboratory work and organic chemistry.

Shop Work.—Carpentry, Forge Work.—The same as in the Mechanical Engineering Course.

Practical Steam Engineering.—A brief course in the theory, design and management of steam engines and boilers. The time will be largely devoted to the slide valve engine and the locomotive type of boiler. The class room work will be supplemented by work in the mechanical laboratory, and will give especial attention to valve setting, the management and care of boilers, pumps, injectors and auxiliary apparatus. For the practical work, the threshing engine and 15 H-P. vertical engine in the Engineering Laboratory will be used.

Horticulture.—General scheme: selection and preparation of site for orchard and small fruits, propagation of trees and plants, comprising production of fruit stocks, grafting, budding, layering, etc.; planting, cultivating, pruning, winter protection, irrigation, harvesting, storing and marketing fruit. The treatment of trees and plants for fungous diseases and parasites.

Landscape Gardening.—Will embrace landscape and kitchen gardening by lectures, also by illustrations drawn from object lessons upon the Experiment Station and College grounds, of trees, plants and flowering shrubs, the method of propagating these, general arrangement, planting and culture, also practical instruction in vegetable and window gardening.

Upon the grounds of the Experiment Station, in connection with the College, is a small but practical nursery; also an orchard in which are propagated and cultivated the various small orchard fruits, deciduous and evergreen trees, vines, etc. The greenhouses and conservatory afford excellent opportunity to acquire a good working knowledge of the science of Horticulture, than which there is no agricultural science of more value to mankind.

Botany and Zoology.—For the general courses in these subjects, see Course in Biology.

COURSE IN BIOLOGY.

It is the purpose of the Biological Course here outlined, not only to afford a liberal education in general science and literature, but also to give the student special training in Botany and Zoology, so that graduates from these departments may be fitted for positions as teachers and specialists in the subjects selected, and also be prepared by an extensive course in the classics and modern languages to take advanced standing for special graduate work in the Eastern universities.

The situation of the College is unexcelled for the study of natural history. In the immediate vicinity of mountains, valleys and plains, whose fauna and flora are but imperfectly known, whose biological regions are wholly undetermined, and whose economic possibilities are yet to be ascertained, the student has an ideal opportunity for independent investigation into the life-history, habits, adaptations and uses of the plants and animals around him. The chief aim of the teacher will be to inspire the student with a love of Nature and to show him the best modern appliances for biological investigation. The philosophical feature of science will always be kept in view and the student will be taught to see and think for himself.

While in general the outline of sub-courses hereafter given will be followed closely, the largest latitude possible with unity of work will be permitted in the choice of electives, and special students will always be encouraged.

At the beginning of the Junior year the student should elect either Botany or Zoology as a major to be continued till graduation, and electives may be substituted for any or all subjects of the other department for the rest of the course.

SCHEDULE OF

COURSE IN BIOLOGY.

FRESHMAN YEAR.

The same as in General Science Course.

(Figures indicate the number of recitations or the actual hours of practice per week. Figures in parenthesis indicate the number of the sub-course.)

SOPHOMORE YEAR.

Fall Term.

Language,	5 or 6:	Latin, or French, 3, or German, 4. American Literature, 2.
History,	3:	The Athenian Empire.
Botany (3),	8:	Histology, Lectures, 2, Laboratory, 6.
Zoology (2),	8:	Comparative Anatomy, Lectures, 2, Laboratory, 6

*Elect the equivalent of a 5-hour study.

Winter Term.

Language,	5 or 6:	Latin, or French, 3, or German, 4. American Literature, 2.
History,	3:	The Athenian Empire.
Botany (4),	6:	†Bacteriology, Lectures, 2, Laboratory, 4.
Zoology (2),	8:	Comparative Anatony, Lectures, 2, Laboratory, 6.

Elect the equivalent of a 5-hour study.

Spring Term.

Language,	5 or 6:	Latin, or French, 3, or German, 4. Shakespeare, 2.
History,	3:	The Roman Republic.
Botany (5),	8:	Physiological, Lectures, 2, Laboratory, 6.
Zoology (2),	8:	Comparative Anatomy, Lectures, 2, Laboratory, 6.

Elect the equivalent of a 5-hour study.

---

*For electives offered, see the General Science Course.

†Not given in 1899-1900; substitute Economic Botany.

COURSE IN BIOLOGY. JUNIOR YEAR.*

Fall Term.

LANGUAGE.	3 or 4:	French, 3, or German, 4.
CIVICS,	3:	Constitutional History.
ASTRONOMY,	3:	
BOTANY (6),	8:	Systematic, Lectures, 2, Laboratory, 6.
ZOOLOGY (3),	8:	Entomology, Lectures, 2, Laboratory, 6.

Elect the equivalent of a 5-hour study.

Winter Term.

LANGUAGE,	3 or 4:	French, 3, or German, 4.
LOGIC,	3:	
CIVICS,	3:	Constitutional Law.
BOTANY (7),	6:	Economic, Lectures, 2, Laboratory, 4.
ZOOLOGY (4),	3:	Human Physiology.

Elect the equivalent of a 5-hour study.

Spring Term.

LANGUAGE,	3 or 4:	French, 3, or German, 4.
ECONOMICS,	5:	Principles of Political Economy.
BOTANY (8),	8:	Ecology, Lectures, 2, Laboratory, 6.
ZOOLOGY,	11:	Embryology (5), Lectures, 2, Laboratory, 6. Human Physiology (4), 3.

Field-work during a part of the summer vacation in preparation for Thesis.

---

*Students should elect either Botany or Zoology as a major for their last two years.

COURSE IN BIOLOGY SENIOR YEAR.

Fall Term.

GEOLOGY,	5:	Dynamical and Structural.
POLITICAL SCIENCE,	5:	International Law.
PHILOSOPHY,	5:	Psychology.
RESEARCH WORK,	10:	Thesis.

Elect the equivalent of a 5-hour or a 3-hour study.

Winter Term.

GEOLOGY,	5:	Historical.
SOCIOLOGY,	5:	
RESEARCH WORK,	15:	Thesis.

Elect the equivalent of a 5-hour study.

Spring Term.

ETHICS,	5:	
RESEARCH WORK,	20:	Thesis.

Elect the equivalent of a 5-hour study.

BOTANY.

DR. BLANKINSHIP.

2. ***Morphology of Cryptogams;*** laboratory culture of fungi; use of the compound microscope; staining and mounting of specimens; drawing throughout. Lectures 2, laboratory 6 hours per week, winter term; required of all Freshmen not electing Engineering courses.

REFERENCES: Bessey's Botany, Goebel's Outlines of Classification, Bennett & Murray's Cryptogamic Botany.

3. ***Histology.***—A study of the cell and cell-contents of the tissues, and of the embryology of flowering plants; staining and mounting of sections; microchemistry and microtechnique. Lectures, 2, and laboratory, 6 hours per week, Fall term, Sophomore year.

REFERENCES: Strasburger's Manual of Vegetable Histology, Goodale's Physiological Botany, Zimmermann's Botanical Microtechnique, Poulsen's Botanical Microchemistry.

4. ***Bacteriology.***—A general study of the bacteria of fermentation, decomposition and disease, their life-history and classification; cultivation in nutrient media; sterilization; pure-cultures; determination of bacteria in water, milk, air, etc., staining and mounting. Lectures, 2, and laboratory, 4 hours per week, Winter term, Sophomore year.

REFERENCES: Manuals of Schrenk, De Bary, Sternberg, and Pearmain & Moore.

This course (4) will not be given in 1899-1900, as it alternates with course (7.)

5. ***Physiology.***—A study of the functions of the living plant organs; the phenomena of assimilation, growth, transpiration, movement, reproduction, etc. Lectures, 2, laboratory and field work, 6 hours per week during the Spring term, Sophomore year.

REFERENCES: The text-books on physiological botany of Goodale, Vines, and Darwin & Acton.

6. ***Systematic Botany;*** continuing the work of (1) and (2). In a study of the local flora the student will be made familiar with the principal orders and genera of the flowering plants, and will learn the practical details of preparing a herbarium. Dried specimens will be used for the most part, and students who intend to take this course should previously make a collection for study while taking it. The construction and use of card indexes will be taught in connection with the work. Lectures, 2, laboratory and field-work, 6 hours per week during the Fall term, Junior year.

REFERENCES: Gray's and Coulter's Manuals, Britton and Brown's Illustrated Flora, Gray's Synoptical Flora, Brewer and Watson's Botany of California, and the various recent monographs of the principal groups.

This course will not be given in 1899-1900, but instead students properly qualified may select one of the following courses:

(*a*). ***The Native Grasses of Montana.***

(*b*). ***The Shrubs and Forest Trees of Montana.***

(*c*). ***A Study of the Parasitic Fungi of Montana.***

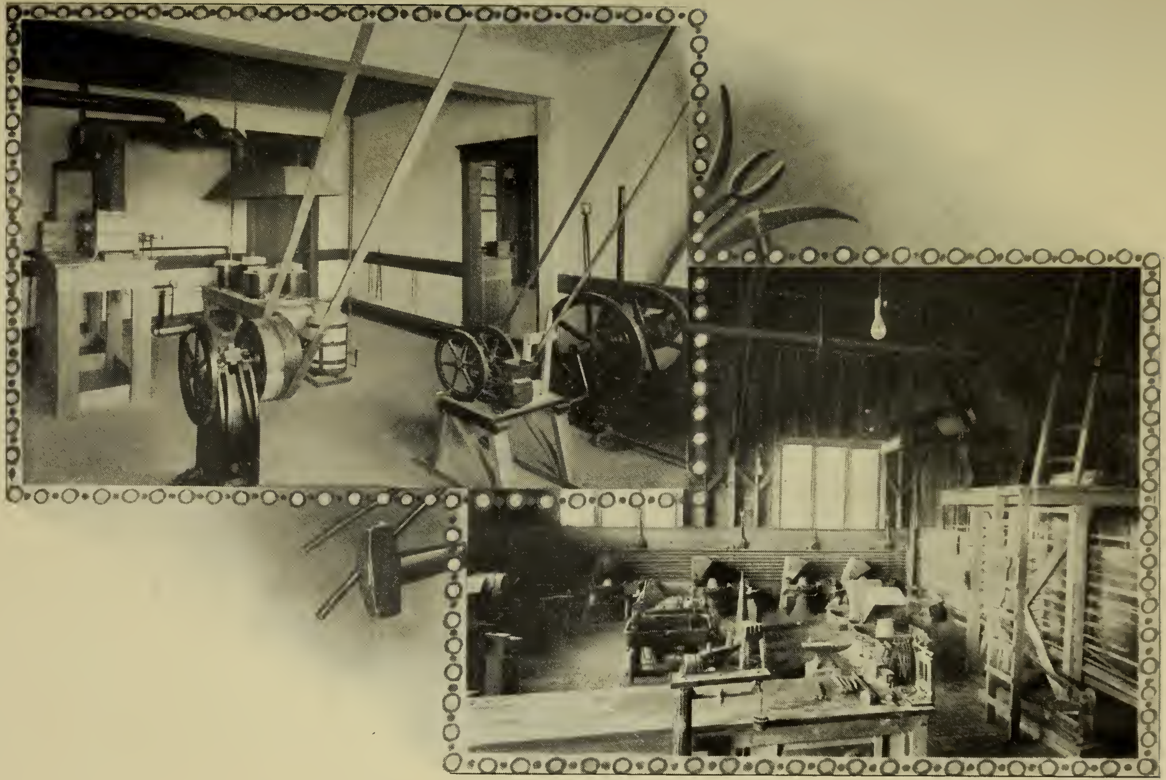
7. ***Economic Botany.***—The plants used for food, shelter, medicine, etc.; weeds, forage plants, food adulteration, vegetable pathology. Lectures, 2, laboratory, 4 hours per week, Junior year. Alternates with course 4.

REFERENCES: Smith's Diseases of Field and Garden Crops, Tubeuf and Smith's Diseases of Plants Induced by Crytogamic Parasites, Flint's Grasses and Forage Plants, De Candolle's Origin of Cultivated Plants, and the various publications of the Department of Agriculture.

8. ***Ecology.***—A study of the adaptation of plants to their environment, their habitat and climatic groups, and the laws controlling their development and distribution; field work in determining these plant formations in the vicinity of Bozeman, and a laboratory study of their histological and morphological characteristics. Lectures, 2, laboratory, 6 hours per week, Spring term, Junior year.

REFERENCES: Warming's Lehrbuch der œkologischen Pflanzengeographie, Drude's Pflanzengeographie von Deutschland, Constantin's Les vegetaux et les milieux cosmiques, Kerner's Natural History of Plants, Henslow's Origin of Plant Structures, Mueller's Fertilization of Flowers.

9. ***Research Work*** for thesis in some department of botany selected by the student, and a summation of his work in a final paper. The hours will be arranged to suit the convenience of the student, but a portion of the work can usually be best done during the summer immediately preceding.



Assay Laboratory

Forge Room

LIBRARY
OF THE
UNIVERSITY of ILLINOIS.

ZOOLOGY.

DR. WILCOX.

1. ***General Structural and Developmental Zoology.***—Special morphology of the various groups of lower animals up to Vermes. Relationship of animal orders one to another. Special and general anatomy and development. Dlssections and microscopic examination.

2. ***Comparative Anatomy*** of the higher forms of animals. Special morphology of Vertebrates. with dissection of a fish, reptile, bird and mammal. Animal histology. The geographical distribution of animals, and paleontology. The meaning of species, evolution, development of the individual and of the race. Protective coloration and resemblance. Habits and instincts.

3. ***Entomology.***—The anatomy, metamorphosis, classification and geographical distribution of insects. Collecting, rearing, and preserving of insects. Study of their life-history and habits. Economic entomology. Insect depredations. Natural and artificial remedies. Animal parasitism.

4. ***Human Physiology.***—Normal and pathological action of organs. Effects of various foods and methods of living upon the health. General hygiene and prevention of disease. . Causes of special and general diseases. Preventive medicine and treatment of disease.

5. ***Embryology and Microtechnique.***—Lectures and laboratory work on the development of the chicken. Killing, preserving and staining methods in animal histology. Microtome sectioning. Drawing with camera lucida, and microscopic technique.

6. ***Research Work*** throughout the Senior Year upon some topic in systematic study, or in the histology, development, or physiology of animals.

For description of subjects other than biological, see the General Science Course.

THE COURSE IN

ANALYTICAL AND APPLIED CHEMISTRY.

DR. TRAPHAGEN AND MR. COBLEIGH.

The purpose of the course in Chemistry is to make educated chemists—men who are not only qualified to make correct analyses of what may be handed them, but who have also had, with their technical training, a good, liberal education. The possibilities of the successful application of chemical knowledge to the solution of the problems of daily life on the farm, in the smelter, in the dye works, in the sugar refinery, in the gas works, in nearly all manufactures and the arts, are too well appreciated to need any argument.

The range of chemical knowledge is too wide to-day to be covered by any one man, therefore it will be wise, when the student of the chemical course has covered the required work, for him to select some definite line which he may decide to make his specialty. This is quite possible, as each student does the greater part of his work, not in the class room, but individually in the laboratory and library.

A description of the work in Chemistry follows. For information concerning other studies taught in this course see remarks under General Science Course.

SCHEDULE OF

COURSE IN CHEMISTRY.

FRESHMAN YEAR.

The same as in General Science Course.

(Figures indicate the number of recitations or the actual hours of practice per week. Figures in parenthesis indicate the number of the sub-course.)

SOPHOMORE YEAR.

Fall Term.

Physics (1),	3:	General Properties, Mechanics and Heat.
Chemistry (11),	3:	Chemical Technology.
Language,	6:	French, 4. American Literature, 2.
History,	3:	The Athenian Empire.
Practicums,	15:	Quantitative Analysis (5), 9. Physical Measurements, 6.
Seminary,	1:	Journal Meetings.

Winter Term.

Physics (1),	3:	Magnetism and Electricity.
Chemistry,	3:	Metallurgy of Iron and Steel.
Language,	6:	French, 4. American Literature, 2.
History,	3:	The Athenian Empire.
Practicums,	18:	Quantitative Analysis (7), 6. Inorganic Preparations, 6. Physical Measurements, 6.
Seminary,	1:	Journal Meetings.

Spring Term.

Physics (3),	3:	Sound and Light.
Chemistry (15),	3:	Metallurgy of Copper, etc.
Language,	6:	French, 4. Shakespeare, 2.
History,	3:	The Roman Republic.
Practicums,	15:	Quantitative Analysis (7), 9. Physical Measurements, 6.
Seminary,	1:	Journal Meetings.

COURSE IN CHEMISTRY. JUNIOR YEAR.

Fall Term.

CHEMISTRY,	9:	Applied Chemistry (12), 3. Chemical Philosophy (6), 3. Organic Chemistry (10), 3.
LANGUAGE,	3:	French.
CIVICS,	3:	Constitutional History.
Practicums,	15:	Quantitative Analysis. 9. Organic Chemistry. 6.
SEMINARY,	2:	Journal Meetings. 1. Conferences. 1.

Winter Term.

CHEMISTRY.	9:	Theoretical Chemistry (8), 3. Industrial Chemistry (13), 3. Organic Chemistry (10), 3.
LANGUAGE,	3:	French.
LOGIC,	3:	Elements of Logic.
Practicums,	15:	Quantitative Analysis, 9. Organic Chemistry, 6.
SEMINARY.	2:	Journal Meetings, 1. Conferences, 1.

Spring Term.

CHEMISTRY,	6:	Theoretical Chemistry (8), 3. Organic Chemistry (10), 3.
LANGUAGE,	3:	French.
ECONOMICS.	5:	Principles of Political Economy.
Practicums,	15:	Quantitative Analysis (14), 9. Organic Chemistry, 6.
SEMINARY,	2:	Journal Meetings, 1. Conferences. 1.

COURSE IN CHEMISTRY.—SENIOR YEAR.

Fall Term.

Chemistry,	3:	Physical Chemistry.
Geology,	5:	Dynamical and Structural.
Political Science,	5:	International Law.
Practicums,	15:	Physical Chemistry, 9. Mineralogy, 6.
Seminary,	2:	Conferences, 1. Journal Meetings, 1.

Winter Term.

Geology,	5:	Historical.
Social Science,	5:	Sociology.
Thesis,	5:	In assigned subject.
Practicums,	15:	Assaying, 9. Thesis Work, 6.
Seminary,	2:	Journal Meetings, 1. Conferences, 1.

Spring Term.

Moral Science,	5:	Principles of Ethics.
Geology,	3:	Economic.
Thesis,	20:	In Laboratory and Library.
Seminary,	3:	Journal Meetings, 1. Conferences, 1.

DESCRIPTION OF SUB-COURSES.

1. ***General Chemistry.***—Lectures on the general principles of chemistry, with frequent recitations. The properties, preparation and applications of the elements and their principal compounds are here studied, and many problems involving quantitative relationships are solved. Text-book: Remsen's Advanced Chemistry.

2. ***Chemical Laboratory.***—Accompanying the above is this course of laboratory work, designed to illustrate experimentally the important laws before considered. The most difficult of these experiments are performed by the instructor in presence of the class, after which the student is expected to repeat them.

3. ***Qualitative Analysis.***—A study of the reactions of the various salts, using first compounds of known composition, and later identifying "unknowns." One lecture, one recitation, and laboratory work.

4. ***Blowpipe Analysis.***—A short course for the purpose of enabling the student, with a small, portable equipment of blowpipe apparatus, to identify the various elements, especially the metals which he is likely to meet with. The various flame, bead, charcoal, plaster and special tests are practiced until they are familiar, and many unknown compounds, principally minerals, are analyzed.

5. ***Elementary Quantitative Analysis.***—This course consists mainly of volumetric analysis, and those elements are determined which can be without the use of the gravimetric method in any part in the standardizing of solutions. The gravimetric estimation of the constituents of some of the more common salts is also made here. Two lectures, one recitation and laboratory work.

6. ***Chemical Philosophy.*** Lectures and recitations on the relations of light, heat, magnetism and electricity to chemistry, and their use in solving its problems.

7. ***Quantitative Analysis.***—Following closely the Waller-Cairn's Manual. The amount of work done in this subject depends upon the student, for while a certain minimum amount of work will be required, the maximum is only limited by the wishes and time of each student. After the required routine work is done the remainder of the student's analytical work will be selected with the purpose of best serving his individual needs. Two lectures, one recitation and laboratory work.

8. ***Theoretical Chemistry.***—Lectures and recitations upon the theories of chemistry which have been advanced at various times and are now held. Text-books: Wurtz's History of Chemical Theory; Meyer's Modern Theories of Chemistry.

9. ***Inorganic Chemical Preparations.***—The preparation of chemically pure laboratory reagents and other compounds; including qualitative and quantitative tests of the purity of the products. Manual: Vulte and Neustadt's Inorganic Chemical Preparations. One lecture, one recitation and laboratory work.

10. ***Organic Chemistry.***—This work consists of lectures, recitations and the preparation of a series of organic compounds, illustrating the properties of the leading classes. Methods of proximate and ultimate analysis will also be experimentally studied. Text-books: Remsen's Organic Chemistry; Orndorff's Manual of Organic Chemistry.

11. ***Chemical Technology.***—Lectures and recitations on Fuels, Refractory Materials, Explosives, Limes, Mortars and Cements, Building Stones, Timber and its preservation, and Metals not considered elsewhere. Text-book: Wagner's Chemical Technology.

12. ***Applied Chemistry.***—A continuation of the work in Chemical Technology. The subjects studied are: Air, Water, Food, Drink, etc.

13. ***Industrial Chemistry.***—A conclusion of the work in Chemical Technology. The subjects discussed are: Acids, Alkalies, Salts, Fibers, Glue, Soap, Dyes, etc.

14. *Special Work in Chemical Laboratory*.—Study of new analytical methods and comparison of various methods to determine accuracy and time required for completion of analysis.

15. *Metallurgy*.—Lectures on the production of Gold, Silver, Copper and Lead, from their ores, the effects of various impurities and their elimination. Especial attention is given to the calculation of furnace charges.

16. *Assaying*.—The situation of our College makes a thorough course in Assaying one of the most important needs, and to meet it we have secured a set of samples and apparatus, and have outlined a course of work which will fully meet the requirements. We shall be able to reproduce all the conditions of the mill or commercial assay office, and to give a thoroughly practical course. Before completing the course the student is given a practical series of samples, representing the daily work of the assayer of a mill or smelter, and will be required to return accurate results within the time usually occupied by the commercial assayer. The importance of this latter fact is generally lost sight of in laboratories of instruction; with us close attention is paid to imparting an ability to handle a large amount of work in a short time, and accuracy is at the same time required. We realize the importance of both, and as a consequence our graduates are not compelled, upon going into commercial work, to meet conditions unfamiliar to them. Many methods, such for instance as the fire assay of iron ore, are rarely used; this being the case we feel it to be a waste of the student's time to give him such work, but rather occupy him in the more common practice, and the testing of many samples at a time. The laboratory is so equipped and arranged as to make this plan possible.

17. *Metallurgical Chemistry*.—A short course in quantitative analysis in which especial attention is given to mill and smelter practice. Short methods are generally given but opportunity is also afforded for work in the more refined

Quantitative Laboratory

Experiment Station Laboratory

LIBRARY
OF THE
UNIVERSITY of ILLINOIS.

though slower methods. Designed especially for students in the engineering courses.

18. ***Physical Chemistry.***—The recent very rapid advance made in this branch of chemistry renders it necessary for all students to possess some knowledge of it. For this purpose a short course in theory and practice is offered including the conductivity, freezing point, boiling point and other methods.

19. ***Journal Meetings—Abstracting.***—In order to develop in the student a habit of careful reading, each student will be required to make abstracts of articles on assigned subjects from the leading journals, and present them at a weekly meeting of students and department instructors, where the topics are freely discussed. They are thus kept in touch with the progress of the science.

20. ***Conferences.***—Regular meetings for the discussion of the progress of the work of the various students in the laboratory. In this way students and instructors are made acquainted with each other's work, and the student is encouraged to greater effort.

21. ***History of Chemistry.***—Lectures on the development of chemistry and upon the contributions of different chemists to its progress.

22. ***Photography.***—At some time during the course an opportunity will be afforded students for the study of the general principles of photography, with practice in exposing, developing, fixing, printing and toning. Various developers will be used and comparisons made of different plates and papers. A very successful camera club existing under the auspices of the College is a great aid in creating interest in this art among the students.

23. ***Thesis.***—In the early part of the Senior year the student selects the subject for his graduating thesis. The work done must include a considerable amount of original research.

HOME SCIENCE COURSE.

The course in Home Science provides systematic schemes for study in those branches which are directly related to healthful living, appropriate clothing, and household decoration. The object of the course is to produce good home-makers. Based upon the General Science Course it provides a liberal course in Domestic Science.

The descriptions of the general courses will be found under the General Science Course. The special studies are:

Sewing.—All the ordinary forms of sewing are taught, including garment making, dress making and embroidery. The work is carefully graded according to the capabilities of the student, and may be utilized by her in the making of her own clothing. A straight line system of cutting and fitting is taught, and systems are furnished at cost.

Household Economy.—Lectures embracing such subjects as food stuffs and their nutritive value, marketing, neatness and order in housekeeping, preparation and serving of foods, food for the well, food for the sick, and talks on etiquette.

Household Sanitation.—Lectures pertaining to the proper care of the home and its inmates.

Hygiene and Emergencies.—Lectures treating of the laws of health and home nursing.

Cooking.—The object of the work in cooking is to familiarize the student with the most economical, healthful and attractive methods of preparing and serving foods. Special attention is given to hygienic cookery.

The economic value of the Aladdin oven is demonstrated, and a short course is given with the chafing dish. Special attention is paid to table laying and decoration, and to serving meals.

SCHEDULE OF
HOME SCIENCE COURSE.

FRESHMAN YEAR.

The same as in General Science Course.

(Figures indicate the number of recitations or the actual hours of practice per week. Figures in parenthesis indicate the number of sub-course.)

SOPHOMORE YEAR.

Fall Term.

LANGUAGE,	5:	*Latin, or French, 3. American Literature, 2.
HISTORY,	3:	The Athenian Empire.
DOMESTIC SCIENCE,	6:	Cooking.
†ELECTIVE,	5 to 9:	One of the following: Analytic Geometry, 5. Chemistry (5), Lectures, 3, Laboratory (5), 6. Physics (1), Lectures, 3, Laboratory (2), 6. Botany (3), Lectures, 2, Laboratory, 6. Zoology (2), Lectures, 2, Laboratory, 6. Art, Lectures, 2, Laboratory, 6.

Winter Term.

LANGUAGE,	5:	*Latin, or French, 3. American Literature, 2.
HISTORY,	3:	The Athenian Empire.
DOMESTIC SCIENCE,	6:	Sewing.
†ELECTIVE,	5 to 9:	One of the following: Calculus, 5. Pedagogy, 5. Chemistry (12), Lectures, 3, Laboratory (7), 6. Physics (1), Lectures, 3, Laboratory (2), 6. ‡Botany (4), Lectures, 2, Laboratory, 6. Zoology (2), Lectures, 2, Laboratory, 6, Art, Lectures, 2, Laboratory, 6.

Spring Term.

LANGUAGE,	5:	*Latin, or French, 3. Shakespeare, 2.
HISTORY,	3:	The Roman Republic.
DOMESTIC SCIENCE.	6:	Emergencies. Home Nursing and Hygiene.
†ELECTIVE,	5 to 9:	One of the following: Calculus, 5. Horticulture, 5. Chemistry (7), Lectures, 3, Laboratory (7), 6. Physics (1), Lectures, 3, Laboratory (2), 6. Botany (5), Lectures, 2, Laboratory, 6. Zoology (2), Lectures, 2, Laboratory, 6. Art, Lectures, 2, Laboratory, 6.

---

*, †, ‡, See notes under General Science Course.

HOME SCIENCE COURSE. JUNIOR YEAR.

Fall Term.

Language, 2: English Literature.
Civics, 3: Constitutional History.
Science, 3: Astronomy.
Domestic Science, 6: Sewing.
Elective, 7 to 9: One of the following:
- Chemistry (10), Lectures, 3, Laboratory, 6.
- Botany (6), Lectures, 2, Laboratory, 6.
- Zoology (3), Lectures, 2, Laboratory, 6.
- Art, Lectures, 2, Laboratory, 6.
- History, Lectures, 3, Library, 4.

Winter Term.

Language, 2: English Literature.
Civics, 3: Constitutional Law.
Mental Science, 3: Elements of Logic.
Zoology (4), 3: Human Physiology.
Special Work, 9: Chemistry, or Biology.
Elective, 7 to 9: One of the following:
- Chemistry (10), Lectures, 3, Laboratory, 6.
- Botany (7), Lectures, 2, Laboratory, 6.
- Art, Lectures 2, Laboratory, 6.
- History, Lectures, 3, Library, 4.

Spring Term.

Language, 2: English Literature.
Economics, 5: Principles of Political Economy.
Zoology (4), 3: Human Physiology.
Special Work, 9: Chemistry, or Biology.
Elective, 5 to 9: One of the following:
- History of Philosophy, 5.
- Landscape Gardening, 5.
- Chemistry (10), Lectures, 3, Laboratory, 6.
- Botany (8), Lectures, 2, Laboratory, 6.
- Zoology (5), Lectures, 2, Laboratory, 6.
- Art, Lectures, 2, Laboratory, 6.
- History, Lectures, 3, Library, 4.

HOME SCIENCE COURSE.—SENIOR YEAR.

Fall Term.

Philosophy,	5:	Psychology.
Geology,	5:	Dynamical and Structural.
Political Science,	5:	International Law.
Thesis Work,	10:	In assigned subject.
Electives.	2 to 8:	One or two of the following:
		Mineralogy and Crystallography, 6.
		English Literature, 2.

Winter Term.

Geology,	5:	Historical.
Social Science,	5:	Sociology.
Thesis,	15:	
Electives,	2 to 11:	One or two of the following:
		Lithology, 6.
		Psychology, 5.
		English Literature, 2.

Spring Term.

Moral Science.	5:	Principles of Ethics.
Domestic Science.	6:	Sewing.
Thesis,	20:	
Optional,	3:	Economic Geology.

MECHANICAL ENGINEERING.

PROF. WILLIAMS AND MR. MCCORMICK.

This course deals with the science of machines. In order that the student may be capable of intelligently and skillfully designing, constructing and supervising all kinds of machinery, he should pursue a thorough course in which the theoretical goes hand in hand with the practical.

While a broad theoretical training is of primary importance, it is believed that from continued practical applications of theoretic conclusions, a broader and more tangible conception of their truths may be derived. To explain theoretic principles, however, is not the only value of the experimental work of the course. If the student desires to go from College to the constructive or operative world, he must be familiar with working machines, methods of shop management, and as much of the every day detail of the machinist's work as it is possible for him to acquire, as a supplement to his higher training.

While it is highly desirable that the engineer should be a man of broad, general culture, the technical requirements of the course are so exacting that the student of Mechanical Engineering has little time to spare for culture work. To obviate the disadvantage arising from this fact some general studies are introduced into the course, in order to make it as broad and comprehensive as is consistent with a thorough training in the direct line chosen.

The general studies of the course,—English, French, German, History, Civics, and Economics,—are described under the General Science Course.

SCHEDULE OF

MECHANICAL ENGINEERING COURSE.

FRESHMAN YEAR.

(Figures indicate the number of recitations or the actual hours of practice per week. Figures in parenthesis indicate the number of the sub-course.)

Fall Term.

Mathematics,	5:	Higher Algebra.
Language,	6:	German, or French, 4. Rhetoric. 2.
Chemistry (1),	4:	Lectures on the non-metals, 3. Recitation, 1.
Practicums,	19:	Freehand Drawing. 3½. Mechanical Drawing, 3½. Shops: Carpentry, 6. Chemistry (2). 6.

Winter Term.

Mathematics,	5:	Higher Algebra, 3. Plane Trigonometry, 2.
Language,	6:	German, or French, 4. Rhetoric, 2.
Chemistry (1),	4:	Lectures on the Metals, 3, Recitation, 1.
Practicums,	19:	Mechanical Drawing, 7. Shops: Carpentry, 6. Chemistry (3), Qualitative Analysis, 6.

Spring Term.

Mathematics,	8:	Trigonometry, 5. Descriptive Geometry, 3.
Language,	6:	German, or French, 4. Rhetoric, 2.
Chemistry (1),	4:	Lectures on the Metals, 3, Recitation, 1.
Practicums,	18:	Drawing: Descriptive Geometry Problems, 6. Shops: Wood Turning and Pattern Making, 12.

MECHANICAL ENGINEERING COURSE. SOPHOMORE YEAR.

Fall Term.

Mathematics,	5:	Analytical Geometry.
Language,	3:	French.
*History.	3:	The Athenian Empire.
Chemistry (11).	3:	Fuels and Refractory Materials.
Physics.	3:	General Properties. Mechanics and Heat.
Practicums,	21:	Physical Measurements. 6.
		Drawing: From Models and Plates. 6.
		Shops: Forge Work. 9.

Winter Term.

Mathematics,	5:	Calculus.
Language,	3:	French.
*History,	3:	The Athenian Empire.
Machine Design,	3:	Constructive Materials of Engineering.
Physics,	3:	Magnetism and Electricity.
Practicums,	21:	Physical Measurements, 3.
		Drawing: From Machines. 6.
		Shops: Forge Work, Chipping and Filing, 6.
		Chemistry (17). Quantitative Analysis, 6.

Spring Term.

Mathematics,	5:	Calculus.
Language,	3:	French.
*History,	3:	The Roman Republic.
Chemistry (15),	3:	Metallurgy of Copper. Gold and Silver.
Physics,	3:	Sound and Light.
Practicums,	21:	Physical Measurements, 6.
		Drawing: Tracing and Blue-Printing. 6.
		Shops: Lathe Work, 9.

---

*Required only of those who have taken German as their modern language requirement.

Wood Working Shop

LIBRARY
OF THE
UNIVERSITY of ILLINOIS.

MECHANICAL ENGINEERING COURSE.—JUNIOR YEAR.

Fall Term.

MATHEMATICS,	5:	Analytic Mechanics.
ELECTRICAL ENGINEERING,	5:	Theory of Direct Current Dynamos and Motors.
CIVIL ENGINEERING,	2:	Elementary Surveying, Lectures,
MACHINE DESIGN,	2:	Kinematics.
Practicums,	21:	Surveying: Field Work, 6. Drawing: Problems in Kinematics, 6. Shops: Planing and Milling, 9.

Winter Term.

MATHEMATICS,	5:	Mechanics of Materials.
STEAM ENGINEERING,	3:	Indicators, Valve Gears, and Link Motions.
MACHINE DESIGN,	3:	Graphic Statics of Mechanisms, 2. Stresses in Framed Structures, 1.
Practicums,	25:	Drawing: Problems in Graphic Statics, 9. Dynamo Design, 4. Mechanical Laboratory: Indicators and Valve Gears, 6. Shops: Gear Cutting, 6.

Spring Term.

MATHEMATICS,	5:	Mechanics of Materials.
STEAM ENGINEERING,	2:	Steam Boilers.
MACHINE DESIGN,	5:	Hoisting and Conveying Machinery, 3. Heating and Ventilating Machinery, 2.
Practicums,	21:	Drawing: Problems in Machine Design, 9. Mechanical Laboratory: Tests of the Srength of Materials, 6. Shops: Tool Making, 6.

MECHANICAL ENGINEERING COURSE.—SENIOR YEAR.

Fall Term.

Steam Engineering,	5:	Thermodynamics of the Steam Engine.
Machine Design,	5:	Mining Machinery, 2.
		Steam Engine Design, 2.
		Seminary, 1.
Practicums,	28:	Drawing: Steam Engine Design, 6.
		Senior Model, 10.
		Mechanical Laboratory: Steam Engine and Boiler Experiments, 6.
		Shops: Senior Model, 6.

Winter Term.

Thermodynamics,	3:	Gas Engines and Refrigerating Machinery.
Hydraulics,	5:	Hydrodynamics and Hydraulic Motors, 3.
		Masonry Dams and Retaining Walls, 2.
Civics,	3:	Constitutional Law.
Practicums,	25:	Drawing, 10.
		Chemistry (16), Assaying, 9.
		Shops: Constructing and Erecting, 6.

Spring Term.

Power Transmission,	3:	Lectures.
Electrical Engineering,	2:	Electrical Mining Machinery.
Economics,	5:	Principles of Political Economy.
Thesis.		
Practicums,	6:	Hydraulic Laboratory, 2.
		Shops, 4.

CHEMISTRY AND PHYSICS.

(For Description of Sub-courses. See Course in Chemistry.)

1, 2. ***General Chemistry.***—Lectures and laboratory.

3. ***Qualitative Analysis.***

11. ***Fuels and Refractory Materials.***

17. ***Metallurgical Chemistry.***—A laboratory course accompanying sub-course 3, Machine Design, and sub-course 15, Chemistry.

15. ***Metallurgy of Copper.***—Lectures.

16. ***Assaying.***

Physics.—The same as for the General Science Course. In addition, students can elect advanced work in Physical Measurements, during their Junior year.

MATHEMATICS.

For the work in *Higher Algebra*, *Trigonometry*, *Analytic Geometry and Calculus*, see General Science Course.

Descriptive Geometry.—Projection of lines, planes, surfaces and solids; intersections, tangents to curves and surfaces; problems in warped surfaces, linear perspective, isometric projection. The class room exercises are accompanied by work in the drafting room.

MECHANICS.

1. ***Analytic Mechanics.***—Shaped with special reference to the practical requirements of engineers, principles rather than formulas are emphasized. Deals with statics, kinematics, kinetics, energy, center of gravity, moment of inertia, friction, and units and dimensions, and mechanical quantities.

2. ***Applied Mechanics.***—The strength and elastic properties of the most important materials of construction from a theoretical standpoint. Applications of theory to practical problems in beams, columns, shafts, rivetings, springs, etc., followed by a laboratory course in testing. Text-book: Church's Mechanics of Engineering.

3. *Hydraulics.*—Hydrostatic pressure, theory of fluid motion, theoretical and experimental formulas for flow through orifices and pipes, over weirs, in conduits, canals and streams; accompanied by a course in hydraulic laboratory. A short course in the construction of masonry dams and retaining walls will be given in this connection.

4. *Testing of Materials of Construction.*—Each student is required to make a definite series of tests of wrought iron, cast iron, steel and wood, in tension, compression, bending and torsion.

STEAM ENGINEERING.

1. *Indicators and Valve Gears.*—A study of the slide-valve, both in its simple form and when used in combination with independent cut-off valves, link-motions, and other reversing gears; automatic cut-off gears, and the Zeuner diagram; principles and operation of the indicator.

1 (a). A Laboratory course in valve setting; testing and calibrating gauges, indicator springs, thermometers, etc.; care and manipulation of the steam engine, and the taking of indicator cards.

2. *Steam Boilers.*—A study of their general construction as to strength and form, their advantages and disadvantages; styles of riveting and bracing; tubes, grate areas, and heating surfaces; boiler settings, injectors and feed pumps, and boiler efficiencies.

2 (a). *Steam Engine and Boiler Testing.*—Complete tests of power plants, including the efficiencies of boiler and engine; calorimeter tests of the quality of steam. Each student is required to perform all the operations necessary for conducting an accurate trial, and to work out the data for an entire test, as well as for individual tests.

3. *Thermodynamics.*—A thorough course in theory, and its application, especially to steam engines.

3 (a). The Laws of Thermodynamics as applied to gas engines and refrigerating machinery.

MACHINE DESIGN.

1. ***Elements of Drawing.***—The use of drawing instruments and plain lettering, sketching of machine parts; orthographic and isometric projections; shades and shadows; problems in geometric construction to teach accuracy in the use of instruments; accompanied by occasional lectures.

2. ***Drafting, Tracing and Blue Printing.***—During this course drawings are made from machines, models and plates, the object being to give the student a general idea of the forms of machine parts and the methods of putting them together. The plates used are duplicates of drawings in use for standard machine construction. Finally an entire machine of moderate complexity is taken as a model from which complete working drawings, tracings and blue prints are made. The student is taught to make working drawings, rather than elaborately finished plates.

3. ***Constructive Materials of Engineering.***—Special attention is given to the methods of production, composition, and physical properties of iron and steel, and the effects of heat treatment and methods of working. Sufficient time is also given to the most important special steels, alloys, brasses and bronzes. This course is supplemented by a course in metallurgical chemistry.

4. ***Kinematics.***—A study of the relative motions of machine parts, including belting, toothed gears, cams and linkages. The class room work is supplemented by a parallel course of drafting.

5. ***Graphic Statics.***—General theory of graphic statics, with application: (a) to the determination of stresses in framed structures, under fixed loads; (b) to finding the external forces acting on machine members, and the proper design of machine parts to resist the applied forces. The course consists of both class-room work and drafting.

6. ***Hoisting and Conveying Machinery.***—A theoretical and practical discussion of such forms of hoisting and conveying machinery as are commonly found in mines, factories,

railway plants and docks. In the drafting room the student will work out a design for some machine of this class.

7. ***Heating and Ventilating Machinery.***—Lectures on the theory and practice of heating and ventilating as applied to buildings and mines, and the machinery and apparatus used for such purposes. The questions of efficiency and economy will be considered. Good opportunity for observation and experiment is afforded by the heating and ventilating apparatus used in the College buildings.

8. ***Mining Machinery.***—A course of lectures on this subject covering pumps, air compressors, drills, etc., and the management and care of such machinery.

9. ***Steam Engine.***—The constructive details of some type of automatic cut-off engine will be worked out in the class room, and working drawings therefor made in the drafting room.

10. ***Senior Model.***—Each class is expected to design, make drawings for, and construct in the College shops, some useful piece of machinery or apparatus, as a part of the work of their senior year. The College furnishes the necessary materials, and the machine on completion becomes part of the College equipment.

SHOP WORK.

1. ***Carpentry.***—The use and care of tools; exercises on the most useful joints and splices; rabbeting, gaining and plowing; framing of timber structures. Each student will be required to frame and erect a miniature building of moderate complexity. The practice work will be preceded by lectures.

2. ***Wood Turning and Pattern Making.***—A systematic course at the lathe and bench in the use of the gouge and chisel in plain and ornamental turning and pattern-making; accompanied by lectures on the principles of pattern-making and molding, core-making and core work.

3. ***Forge Work.***—Exercises in wrought iron consisting of drawing, upsetting, shaping, and welding. The work in steel includes the forging and tempering of punches, drills, chisels, lathe tools and springs. *All of Fall term and five weeks of Winter term, Sophomore year.*

4. ***Chipping and Filing.***—Suitable exercises are provided to teach the student the use of the hammer, chisel, file, and scraper. *Eight weeks of Winter term, Sophomore year.*

5. ***Lathe Work.***—Exercises in turning, boring, drilling, reaming and thread cutting, in wrought iron, cast iron and brass. Close attention is paid to the proper speed to be used for the different operations and for different materials. The use of calipers and other small tools is taught, and accurate work is required.

6. ***Planing and Milling.***—The planer, shaper, and milling machine are taken up together, and the student learns the limitations and comparative merits of each machine.

7. ***Gear Cutting.***—This includes methods for determining the diameter, and the cutter to be used. The blanks are turned to size on the lathe; the teeth cut on the milling machine.

8. ***Tool Making.***—Exercises in turning, grinding, milling, filing, tempering, and polishing taps, reamers, and dies.

9. ***Senior Model.***—The entire Senior year is devoted to the construction and erection of a complete machine, the design of which has previously been worked out in the drafting room.

Surveying.—The elements of this science are taught, which includes the theory of surveying, the use of the compass, transit, level, chain and rods; all adjustments of instruments; surveying of fields, running of levels, triangulation, computation of areas and earthwork. Both class-room and field work.

Dynamo and Motor Design.—Electrical Engineering, sub-course 1.

Electrical Mining Machinery.—Electrical Engineering, sub-course 7.

Power Transmission.—Lectures on the various methods of transmitting power, including shafting, rope, belt, and toothed gearing; hydraulic, pneumatic and electrical transmission; the adaptability and efficiency of each.

Library Work.—The library is well supplied with standard works of reference and the leading engineering periodicals. Weekly meetings will be held to encourage students in the use of current engineering literature.

Thesis.—Before graduation each student must present a suitable thesis, which shall be the result of original investigation. The subject must be chosen at the beginning of the Senior year.

ELECTRICAL ENGINEERING.

PROF. WILLIAMS.

During the past twenty-five years electrical discoveries and inventions have multiplied at a phenomenal rate, and the commercial applications of electricity are now so numerous and so constantly increasing as to make it one of the leading branches of engineering. Its great and growing commercial importance in Montana makes it peculiarly fitting that the State Technical School should offer a course in Electrical Engineering to its students.

The general aim of the course will be to thoroughly ground the student in the scientific laws forming the basis of his profession, at the same time training him to adapt these laws to practice, to use his judgment, and apply strictly accurate and honest methods in all operations.

It is evident that a line of study which accomplishes the ends suggested will furnish an excellent mental training, but it is thought important to introduce additional studies especially adapted to furnish a broad and general culture. Hence a considerable amount of time is allowed for the study of language, history and political science.

As the well equipped electrical engineer must have a thorough knowledge of the principles of Steam and Hydraulic Engineering, Machine Design, and the Mechanics of Machinery, in addition to the subjects directly belonging to his special department, this course has been based on that in Mechanical Engineering, differing essentially from it only in the technical courses of the Junior and Senior years.

A description of the fundamental subjects common to the two courses will be found under the title of the Mechanical Engineering Course.

SCHEDULE OF

ELECTRICAL ENGINEERING COURSE.

FRESHMAN AND SOPHOMORE YEARS.

The same as for the Mechanical Engineering Course.

JUNIOR YEAR.

(Figures indicate the number of recitations or the actual hours of practice per week.)

Fall Term.

MATHEMATICS,	5:	Analytic Mechanics.
ELECTRICAL ENGINEERING,	5:	Theory of Direct Current Dynamos and Motors.
CIVIL ENGINEERING,	2:	Surveying, Lectures.
MACHINE DESIGN,	2:	Kinematics.
Practicums,	21:	Drawing: Problems in Kinematics, 6. Physics: Electrical Measurements, 9. Surveying: Field Work, 6.

Winter Term.

MATHEMATICS,	5:	Mechanics of Materials.
STEAM ENGINEERING,	3:	Indicators, Valve Gears, and Link Motions.
MACHINE DESIGN,	3:	Graphic Statics of Mechanisms, 2. Stresses in Framed Structures, 1.
Practicums,	25:	Drawing: Problems in Graphic Statics, 9 Dynamo Degign, 4. Mechanical Laboratory: Indicators and Valve Gears, 6. Electrical Laboratory: Dynamo and Motor Testing, 6.

Spring Term.

MATHEMATICS,	5:	Mechanics of Materials.
STEAM ENGINEERING,	2:	Steam Boilers.
ELECTRICAL ENGINEERING,	3:	Primary and Secondary Batteries.
MACHINE DESIGN,	3:	Hoisting and Conveying Machinery.
Practicums,	21:	Drawing: Hoisting Machinery, 6. Mechanical Laboratory: Tests of the Strength of Materials, 6. Electrical Laboratory: Primary and Secondary Batteries, 3. Shops: Planing and Milling, 6.

ELECTRICAL ENGINEERING COURSE.—SENIOR YEAR.

Fall Term.

Electrical Engineering,	5:	Theory and Application of Alternating Currents.
Steam Engineering,	5:	Thermodynamics of the Steam Engine.
Machine Design,	1:	Seminary.
Practicums,	25:	Drawing: Commercial Electrical Machinery, 10. Mechanical Laboratory: Steam Engine and Boiler Experiments, 6. Electrical Laboratory: Alternating Currents, 3. Shops: Milling and Gear Cutting, 6.

Winter Term.

Electrical Engineering,	7:	Theory and Application of Alternating Currents, 2. Electric Light and Power Transmission, 3. Electrolysis and Electro-Metallurgy, 2.
Hydraulics,	5:	Hydrodynamics and Hydraulic Motors, 3. Masonry Dams and Retaining Walls, 2.
Civics,	3:	Constitutional Law.
Practicums,	12:	Drawing: Alternating Current Machinery, 4. Electrical Laboratory: Alternating Currents, 4. Electro-Metallurgy, 4.

Spring Term.

Electrical Engineering,	5:	Electric Railways, 3. Electrical Mining Machinery, 2.
Economics,	5:	Principles of Political Economy.
Thesis.		
Practicums,	5:	Hydraulic Laboratory, 2. Electrical Laboratory: Polyphase Testing, 3.

DESCRIPTION OF SUB-COURSES.

1. ***Direct Current Dynamos and Motors.***—The principles of electro-magnetism, the laws of simple magnetic circuits, and the winding of electro-magnets; principles, design, construction, and testing of direct-current dynamos and motors. The theoretical work will be followed by the complete design, in the drafting room, of a dynamo or motor. Textbook: Jackson's Electro-Magnets and Dynamo Construction.

1 (a). ***Dynamo and Motor Testing.***—A laboratory course in which students determine the characteristic curves, resistances, inductances, magnetic leakage, and efficiences of various types of direct-current machines.

2. ***Batteries.***—Construction and working of primary and secondary batteries, and their commercial use. In connection with the class-room work, students will make comparative efficiency, and regulation tests of various standard types of primary and secondary batteries. On account of the rapidly increasing use of accumulators, the greater part of the course will be devoted to them.

3. ***Alternating Currents.***—The theory of the generation and utilization of alternating currents; the design and construction of alternating current dynamos, transformers, and motors; methods of testing alternating current machinery. In connection with this course, the student will work out, in the drafting room, complete designs for several commercial alternating current machines. Textbook; Jackson's Alternating Currents and Machinery.

3 (a). ***Alternating Current Testing.***—Laboratory tests to determine self-induction, capacity, and mutual induction of alternating current circuits; regulation and efficiency of transformers, dynamos and motors; polyphase testing in the Spring term.

4. ***Electrolysis and Electro-Metallurgy.***—Electrolytic theory, and its practical applications to electrotyping, electro-

plating, the treatment of ores, and electrolytic separation and refining of metals. Lectures and laboratory work.

5. ***Electric Light and Power Transmission.***—A study of the different systems of distribution used in arc and incandescent lighting, the advantages and disadvantages of each; the selection and arrangement of machinery for generating plants; the location, erection and cost of distributing lines; the transmission and distribution of power by direct current, single and polyphase alternating current systems.

6. ***Electric Railways.***—Selection, installation, and arrangement of engines, boilers and generators for city and suburban power plants; types of apparatus, and methods of control in power house, and on cars; erection and testing of circuits; car equipments and wiring; methods of track location, construction and maintenance; selection of equipment for special conditions; storage battery traction, and storage battery auxiliaries.

7. ***Electrical Mining Machinery.***—The special applications of electrical power in mining operations, electrical pumps, air compressors, hoists, drills and cutters; electrical haulage; electric lighting and ventilation of mines.

Electrical Measurements.—A laboratory course in measurements of precision; calibration and testing of instruments, using the voltameter, standard cell, Kelvin balance, etc.; determination of magnetic induction, permeability, and hysteresis losses by the ballistic method; testing of electric lines for the location of faults and grounds.

Journal Reading is encouraged, and frequent conferences will be held to discuss topics of interest in the current periodicals. The library is well supplied with leading engineering periodicals, transactions of engineering societies, and standard books of reference.

Thesis.—Before graduation each student must present a suitable thesis, which shall be the result of original investigation. The subject must be chosen at the beginning of the Senior year.

MILITARY SCIENCE.

An officer will be detailed by the Secretary of War for the purpose of instructing the students in military science and tactics.

Military Drill is required of all male students, unless excused by the faculty for special reasons, and satisfactory work in this department will be a requisite for graduation.

Object.—The object of instruction in this department is to improve the habits and manners of the students, and also for the development of health and physical form, but at the same time it gives that military knowledge which every citizen should possess, that he may render intelligent aid to his country or state in case of emergency.

It cultivates a manly spirit, a ready and implicit obedience to orders, a respect for authority, and a self-restraint which are of inestimable value to the young man on leaving college.

Instruction is both theoretical and practical.

Practical.—This instruction begins with the school of the soldier, including the setting-up exercises, military gymnastics and bayonet exercise, which give an erect and soldierly bearing.

The squad drill will be followed by company and battalion drill.

Artillery Instruction will consist in the care and service of two field-pieces. Considerable attention will be given to target practice, military signaling, practice marches, and camping. The College is supplied with tents, Springfield rifles, two field-pieces of artillery, and a liberal supply of ammunition.

Theoretical.—Elementary instruction will be given by means of lectures and recitations in the art and science of war, armies and their organization, modern tactics, small arms, explosives, care of troops in the field, military correspondence and reports, military and martial law, including the relations between the military and the civil.

War Department Record.—At the close of the year the names of the three cadets in the graduating class, most distinguished in military science and tactics, are reported to the War Department for insertion in the United States Army Register. The military instruction will occupy about three hours weekly, and will not interfere with the students' regular work.

Uniform.—Students will be expected to provide themselves with the regulation military uniform, which is both inexpensive and durable.

No person will be allowed to take military drill who is not doing other college work.

REQUIREMENTS FOR ADMISSION.

Candidates for the Freshman class, in any of the college courses, must be graduates of the Preparatory Department, of an accredited High School, or pass a satisfactory examination upon the subjects included in the requirements of the State Board of Education for Accredited High Schools.

The following is the list of Accredited High Schools:

Anaconda,
Bozeman,
Butte,
Dillon,
Great Falls,
Helena,
Kalispell,
Miles City,
Missoula.

Advanced Standing.—This College will accept records from all reputable Colleges for credits for advanced standing. Such records are accepted so far as they cover, or are equivalent to, the work done in the course in which the candidate applies for advanced standing.

DEGREES.

Upon the satisfactory completion of any of the College courses the following degrees will be conferred:

For the General Science Course, the Biological Course, and the Home Science Course, the degree of

BACHELOR OF SCIENCE.

For the Course in Agriculture, the degree of

BACHELOR OF SCIENTIFIC AGRICULTURE.

For the Course in Chemistry, the degree of

BACHELOR OF ANALYTICAL CHEMISTRY.

For the Course in Mechanical Engineering, the degree of

BACHELOR OF MECHANICAL ENGINEERING.

For the Course in Electrical Engineering, the degree of

BACHELOR OF ELECTRICAL ENGINEERING.

ADVANCED DEGREES.

On the completion of one year of post-graduate work, or three years of professsional work, and the presentation of an acceptable thesis, the College will confer upon the holders of Bachelors' Degrees, in their respective courses, the degrees of *Master of Science*, *Master of Scientific Agriculture*, *Analytical Chemist*, *Mechanical Engineer*, *and Electrical Engineer.*

RHETORICALS.

Exercises in public speaking under the supervision of an instructor will be required of all students not actively engaged in the work of the college literary societies. Declamations or themes will be required of the preparatory classes, and essays or orations of the college students.

Dining Room

Kitchen

Sewing Room

LIBRARY
OF THE
UNIVERSITY of ILLINOIS.

THE GALLATIN FOREST RESERVE.

This Reserve, set apart by Presidential Proclamation, is situated in its nearest boundaries about seven miles from the College and Experiment Station. It comprises some 4,300 acres of land, and as it is within the limits of the Northern Pacific Railway grant of public lands, it really, to all practical intents and purposes, is double this extent.

It covers the head waters of Bozeman, Middle and Cottonwood Creeks, and affords the College and Station the grandest of opportunities for the studies and investigations of the twin sciences, forestry and irrigation.

The creation of this Reserve assumed tangible form in 1897 by the circulation of a petition to the Secretary of the Interior for the setting apart of this portion of the public domain for the study and scientific investigation of forestry and irrigation. This petition received the endorsement of the National Irrigation and Forestry Congresses in 1893, as well as that of many distinguished workers in these lines, with the result that the Reserve has been duly created and set apart for the specific purposes indicated.

The Montana College of Agriculture and Mechanic Arts has reason to be proud of the fact, that while it is the youngest of all such state institutions, it is the first to secure so valuable an aid to the study of these important adjuncts of agriculture.

PREPARATORY DEPARTMENT.

Miss M. A. Cantwell, Principal.
Miss May Travis, Instructor.
Miss Virginia H. Corbett, Instructor.

This department of instruction has been extended to three years, thus placing it on a level with the Accredited High Schools of the state.

The course as it now stands provides, not only a thorough drill in the common branches, but in addition, elementary work in the natural sciences, a choice in the languages, some knowledge of manual training, and domestic science.

The object of this course is to prepare students for the Freshman class in College. It furnishes a fair general knowledge to those whose circumstances will not allow taking a regular College course, and is also helpful to those qualifying themselves to teach.

A liberal course of reading is given for each year, and students are requested to cover the course as a part of their required work. It is also desirable that students purchase, as far as possible, these books, thus making them a part of their own library.

For entrance the student should be at least thirteen years of age and shall have finished the work requisite for admission to the ninth grade of High School work.

Applicants will be required to pass an examination, or otherwise satisfy the Faculty of their proficiency before entering any classes.

To Parents and Students.—It is highly important that students should enter at the opening of the Fall term, as much of the year's work is based upon the principles laid down at the beginning.

Bring all text-books, as they will be of much assistance for reference.

PREPARATORY COURSE.

(Figures indicate number of exercises per week.)

First Year.

FALL TERM.	WINTER TERM.	SPRING TERM.
Latin or Etymology, 5.	Latin or Literature, 5.	Latin or Literature, 5.
Algebra, 5.	Algebra, 5.	Algebra, 5.
English Composition, 5.	English Composition, 2.	Physical Geography, 5.
Anatomy, 3.	Physical Geography, 3.	Civics, 5.
Sewing, 4.	Physiology, 3.	
	Sewing, 4.	

Second Year.

FALL TERM.	WINTER TERM.	SPRING TERM.
Latin or German, 5.	Latin or German, 5.	Latin or German, 5.
Algebra, 3.	Algebra, 3.	Mathematical Reviews, 3.
Drawing, 8.	Drawing, 8.	Drawing, 4.
Rhetoric, 5.	Rhetoric, 5.	Horticulture, 3, or Cooking, 2-4.
Elocution, 2.	Elocution, 2.	Elocution, 2.

Third Year.

FALL TERM.	WINTER TERM.	SPRING TERM.
Latin or German, 4.	Latin or German, 4.	Latin or German, 4.
Geometry, 5.	Geometry, 5.	Geometry, 5.
Physics, 3.	Physics, 3.	Physics, 3.
General History, 3.	Botany, 2.	Botany, 2.
American Literature, 2.	General History, 3.	General History, 3.
	American Literature, 2.	American Literature, 2.

NOTE.—Each of the Natural Sciences in this course requires two hours of laboratory work weekly for each class recitation.

English.—The work in English includes (1) Etymology and Literature, (2) English Composition, (3) Rhetoric, (4) American Literature.

(1). ***Etymology and Literature.***—One term of Etymology is offered to those who elect English in the first year of the Preparatory course. A brief history of the growth of the English language is given, followed by exercises in word building with Greek, Latin, and Anglo-Saxon prefixes, suffixes and roots. The student thus becomes familiar with the derivation of many common words, as well as with the significance of terms which he will use later in the sciences. Swinton's text-book is used.

Literature.—Skinner's "Studies in Literature" is used as the basis of work during the Winter and Spring terms. The purpose of this course is to teach pupils to understand the art in literature and to develop their power of appreciating masterpieces of English. This fundamental work is followed by a brief historical outline study of the periods of English Literature.

(2) and (3). ***English Composition and Rhetoric.***—The aim of the course in English Composition and Rhetoric is to secure accurate and graceful expression, to afford constant exercise in composition work. In connection with this work a classic will be made the subject of class-room study, thus forming a basis for the study of American Literature.

(4). ***American Literature.***—The same general methods used in the literature of the first year will be followed in this course, the object being to develop intelligent appreciation of American masterpieces, and to promote a love for our standard literature. Several American classics will be made the subject of critical class-room study. The student will find in the library valuable works of reference.

General History.—The work in history will follow as far as practicable the line suggested for high school work by the State Board of Education. The object of the course will be an acquaintance with the great epochs of history with special attention to what Greece and Rome have done for the world's civilization. A text book will be used, supplemented by library references whenever desirable.

Latin.—(1). In the first year's work the aim is to secure a ready knowledge of the inflection forms, the main rules of syntax, and a vocabulary which will prepare for easy Latin reading. For this purpose Collar and Daniell's First Latin Book is used, which in connection with grammatical study gives reading lessons adapted to the ability of the learner. (2). Drill similar to that of the first year is continued in this course in connection with the reading of easy selections from classic authors—such as are found in Arrowsmith & Whicher's Latin Reader. The aim is to enable the student to read the simpler classics readily. (3). CICERO.—The four orations against Catiline are read, and three others. Work in prose composition is required during a part of the time. Roman politics, as compared with those of our own day, always interest students who have an intelligent interest in current events, and there is every opportunity for such comparative study in this course.

German.—In accordance with the present college entrance requirements in Montana, two years of German are now offered in the Preparatory Course as a substitute for Latin. The work of the first year is of the usual elementary nature, including study of grammar, composition, pronunciation, careful reading of easy texts and sight reading. The second year's work is also largely practical, but affords as well an introduction to classic German literature. The required reading, during the two years, is not less than six hundred pages.

Mathematics.—The subject of Mathematics, embracing (1) Algebra, and (2) Geometry, is made practical as far as may be. Actual measurements are taken by the students, and original demonstrations, involving previous principles, are carefully brought out. A mathematical review will be given in the Spring term of the second year, whereby students will be enabled to bring up delinquencies.

Elementary Physics.—This subject is taught almost solely by means of experiments performed by the students, only such additional instruction being given as shall be necessary to bring about a more thorough appreciation of the principles involved in the different experiments. The student is required to keep neat and complete notes on each experiment, and to answer questions intended to bring out a full understanding of the problems studied.

Human Anatomy and Physiology.—The elements of Human Anatomy, gross and microscopic. Form, structure and position of organs. Dissections of common mammals before the class. The activities and functions of organs in health and disease. General principles of nutrition, exercise and sanitation.

General Botany.—Structure, morphology and classification of Phanerogams, introductory to the more advanced courses. Each student is expected to collect, press and name 100 species, 20 of which must be properly mounted for a herbarium. Recitations or lectures 2, and laboratory 4 hours per week; Winter and Spring terms, Senior Preparatory year.

TEXT BOOKS: Gray's Lessons and Coulter's Manual of Rocky Mountain Botany.

Drawing.—Free-hand drawing from geometric solids and casts. Study of light and shade. Clay modeling. Object drawing. Study of plant forms, with suggestions for their application to design, Memory and time drawing. Blackboard work frequently.

Horticulture.—Three periods per week in Spring term of the second year. Instruction will consist of lectures upon orcharding and small fruits, with field work in same: *Amateur Fruit Growing*, by Prof. Samuel B. Green, will be used as a text book.

Elocution.—This course will consist of reading and vocal drill; exercises for the development of the voice-producing muscles, and general physical culture. During the Winter term each student will prepare a recitation to be given before the class.

Physical Geography will be taught the last half of the first year. Maury's text-book will be the basis of work, but as much field-work will be done by the student as will make the subject practical.

Domestic Science.—A systematic course in hand and machine sewing is given during the Fall and Winter terms. Each student furnishes her own material, as the garment made forms a part of her own wardrobe. Students passing a satisfactory examination in sewing will be excused.

Cooking.—The work of this course is carried on during the Spring term of the second year, and is both theoretical and practical. Special attention is given to table setting, table etiquette and serving of meals. A reception is given during this term to the Faculty and members of the Board.

Civics.—The work in this subject occupies five hours per week during the Spring term of the second year and embraces the study of the Constitution of the United States, also the study of the Montana State Constitution. Class discussion on interesting topics pertaining to the subject is encouraged. Special attention will be given to current topics.

Military Drill will be required of male students.

Graduation.—Regular graduating exercises are held in this department, and students who satisfactorily complete the Preparatory Course will be given a suitable diploma.

⁂

COURSE OF READING FOR PREPARATORY DEPARTMENT.

First Year.

Merchant of Venice.
Dickens' Child's History of England.
Thanatopsis, to be memorized.
Emerson's Fortunes of the Republic.
Conquest of Mexico.
Ivanhoe, Kenilworth, or Rob Roy.
Boys of '76.
Old Times in the Colonies.

Second Year.

David Copperfield, Oliver Twist.
Pickwick Papers, or Bleak House.
Silas Marner.
Kathrina.
Last Days of Pompeii.
Sesame and Lilies.

Third Year.

Heroes and Hero Worship.
Emerson's Essay on Behavior.
Lectures on Architecture.
Prince of India, or Ben Hur.
Autocrat of the Breakfast Table.

BUSINESS DEPARTMENT.

Prof. H. G. Phelps, Principal.
Miss Stella E. Shaff, Instructor.
Henry Lehrkind, Assistant.

Requirements for Entrance.—Students wishing to pursue this course must have passed in the studies laid down in the first year of the Preparatory Course, except that Etymology and Literature are required instead of Latin, and Sewing is not required.

Requirements for Graduation.—The studies of the first two years of the Preparatory Course, except Latin, Sewing, German, Elocution, Horticulture and Cooking.

COURSE IN BOOK-KEEPING.

FALL TERM.	WINTER TERM.
Penmanship, 4.	Penmanship, 4.
Business Law and Forms, 5.	Book-keeping, 5.
Letter Writing, 5.	Spelling, 5.
Book-keeping, 5.	

SPRING TERM.

Penmanship, 5.
Book-keeping, 5.
Office Practice, 5.

Penmanship.—The course in penmanship aims to teach a plain modern business hand. An excellent handwriting is required of every one that enters into the employ of a first-class business firm.

Business Law.—This subject is very important to any one, and especially to him who expects to engage in business, either for himself or others.

In this subject the student is taught the fundamental rules governing contracts, commercial papers, sale of personal property, bailments, insurance, interest, etc. The practical side of the subject is the drawing of all kinds of legal papers, from the simple contract to the complete organization of a corporation.

Letter Writing.—This subject is not taught by the lecture method,' but instead the student is required to *write* all kinds of commercial letters and papers. The writing of these papers soon teaches proper punctuation, capitalization and paragraphing of the different parts.

Book-keeping.—As soon as the student enters school, he is given a cash capital and at once begins business for himself, buying and selling merchandise among his fellow students. The Ellis System, "Learn to Do by Doing," is used.

Every transaction in this work is a real one—precisely as it would be done in a business office.

Business Sections.—The main room of the Book-keeping Department is divided into three sections, viz.: Section No. 1, Section No. 2 and the Chicago House. Each section is a city in itself, and the students perform their transactions orally among themselves and the different offices of that section. But all business with students of the other section or the Chicago House is done by correspondence. Hence, we have intercommunication work right at home. The students of one section are entire strangers to those of the other, so far as their business dealings are concerned. By this means the student is inspired to do better work.

The two sections and Chicago House are connected by a railroad which carries the mail and freight from one section to the other.

OFFICE DEPARTMENT.

Each section is furnished with a complete set of offices, such as College National Bank, Commercial Exchange, Railroad, Postoffice, etc.

These offices are under the efficient management of the Post Graduate students for the Fall and Winter terms.

At the beginning of the Spring term, students of the Practical Department take charge of the offices, superintended by the Post Graduates, who are in constant consultation with the instructor.

Deposit.—A deposit of one dollar is required for the use of cabinet.

POST GRADUATE COURSE IN BOOK-KEEPING.

Requirements.—The student must have completed the first year's course in book-keeping.

FALL TERM.	WINTER TERM.
Office Management, 5.	Office Management, 5.
Banking, 5.	Financial Problems, 5.
Penmanship, 5.	Shorthand (Manual), 5.
	Typewriting, 5.

SPRING TERM.

Lettering and Engrossing, 5.
Four Business Essays.
Shorthand (Manual), 5.
Typewriting, 5.
Auditing, 5.

This course is designed to give the student a higher technical knowledge of Accounts. The student first learns the principles of auditing in proprietorship, partnership, and corporation book-keeping. He then takes charge of the books of students, which are out of balance or incorrectly written up or kept. This work is under the direction of the instructor.

In Financial Problems he finds much valuable work in solving problems of different degrees of complexity, winding up the affairs of partnerships, corporations and estates. Much of the course is original investigation.

Two terms of shorthand are given, in which time the student should become quite proficient as an amanuensis.

Upon graduation, the Degree of Master of Accounts will be conferred.

COURSE IN SHORTHAND AND TYPEWRITING.

FALL TERM.

Manual of Shorthand, 5.
Business Law and Forms, 5.
Letter Writing, 5.
Penmanship, 5.
Typewriting, 5.

WINTER TERM.

Reporter's Companion, 5.
Typewriting, 5.
Penmanship, 5.
Dictation, 5.

SPRING TERM.

Book-keeping, 5.
Dictation, 5.
Typewriting, 5.

Requirements for Entrance and Graduation.—The same as those for book-keeping.

It is very important that the student should possess a good English education, without which his services would be entirely useless to his employer.

During the year he will receive instruction in both theoretical and practical shorthand, fitting him for the duties of amanuensis or court reporter.

The work in typewriting consists in the writing of letters, legal documents, reports, bills, contracts, envelope directing, manifolding, care of machines, etc. Much of the work in this course is done for instructors and outside persons.

Demand for Stenographers.—There is an ever increasing demand for shorthand writers. We are unable to supply the demand for students who can do first-class work.

Time Required.—Together with other branches of the course, the student's entire time and attention is required for one school year. If the student has done the work in a satisfactory manner, and has attained a speed of 100 words per minute, and can read and transcribe the same on the typewriter without hesitation, he is permitted to graduate.

SHORT COURSE IN AGRICULTURE.

In addition to the four years' Course the College provides a shorter one, consisting of three years, of two terms each, occupying the same time as the Fall and Winter College terms.

This course is designed to meet the wants of those who wish to make a more practical study of agriculture and who cannot remain throughout the entire College year. The strictly agricultural branches are combined with some work in language, English and mathematics included and already described in the first two years of the Preparatory Course. In addition to this, important and essential work in Natural Science has been added, and is hereinafter described.

In the establishment of this course it was the desire of the Board and Faculty to present a comprehensive scheme of study that would be as inexpensive as possible. The student is required to pay a general fee of $5, and fees covering the cost of material used. He has the free use of the College library, containing 3,700 carefully selected volumes and 2,500 pamphlets, besides the best agricultural papers published, choice magazines, daily and weekly newspapers.

SCHEDULE OF

SHORT AGRICULTURAL COURSE.

(Figures indicate number of exercises per week.)

First Year.

FALL TERM.	WINTER TERM.
Algebra, 5.	Algebra, 5.
English Composition, 5.	English Composition, 2.
Anatomy, 3.	Physical Geography, 3.
Soils, 3.	Physiology, 3.
	Cultivating Farm Crops, 4.
	Carpentry, 9.

Second Year.

FALL TERM.	WINTER TERM.
Algebra, 3.	Algebra, 3.
Inorganic Chemistry, 5.	Rhetoric, 5.
Rhetoric, 5.	Breeds and Breeding, 5.
Farm Accounts, 3.	Horticulture, 5.
Forge Work, 9.	Organic Chemistry, 3.
	Dairying, 9.

Third Year.

FALL TERM.	WINTER TERM.
Veterinary Anatomy, 3.	Veterinary Pathology and Obstetrics, 5.
Botany (Structural), 3.	Agricultural Chemistry, 5.
Irrigation, Leveling and Road making, 5.	Forestry and Landscape Gardening, 4.
Entomology, 5.	Botany, 3.
Feeds and Feeding, 3.	Poultry and Apiculture, 3.
	Practical Steam Engine, 3.
	Engineering Laboratory, 6.

AGRICULTURE.

PROF. ROBT. S. SHAW.

Farm Dairying.—These lectures treat of the adaptability of this branch of farming to certain localities; small dairies and creameries; butter and cheese making, testing of milk; the use of the lactometer and the Babcock milk test. Breeds of dairy animals; rearing, feeding, and management of dairy cows.

Cultivation of Farm Crops.—This subject deals with the preparation of land for crops; plowing, harrowing, seeding, irrigating and harvesting; various methods used and their action upon soil and crop; rotation and fertilization of crops; summer fallowing; preservation and maintenance of fertility; manufacture and use of fertilizers; composition and physical properties of the soil; conservation of moisture and plant food; the atmosphere as a source of plant food; action of frost, wind, and climate on crops.

Breeds and Breeding.—The subject of Breeds of Live Stock treats of the characteristics of each breed, their origin and adaptability to various conditions in the country from which they originated. Comparison is made of these conditions with those present in Montana, and the breeds best adapted to our climate, range and market are indicated. An insight is given into the methods of registering stock, thus leading to a knowledge of the use of the herd book and the value of pedigree.

The care of breeding animals; practices, principles and methods of breeding, including atavism, heredity, selection, control of sex, in-breeding, crossing; parental and climatic influences with special reference to conditions present in Montana.

Feeds and Feeding.—This subject deals with the constituents of foods and their relation to the animal body. Various feeding standards; nutritive ratio; feeding stuffs; preparation and harvesting of roots, fodders, etc. Feeding for beef, mutton, pork, milk, work, and a maintenance ration. The effect of food upon the various breeds, and the influence of the individuality of animals. The object of this work is to aid the student in becoming a practical and intelligent feeder. He is given an opportunity to see the principles taught in the class-room practically applied in the feeding of the various animals under experiment on the Experiment Station.

Poultry.—Lectures on breeds, their characteristics and comparative values for special purposes; construction of poultry houses; feeding and management.

Apiculture.—A course of lectures with illustrations, as far as possible, showing methods of construction and use of appliances required, as well as methods used in care and handling of bees.

HORTICULTURE.

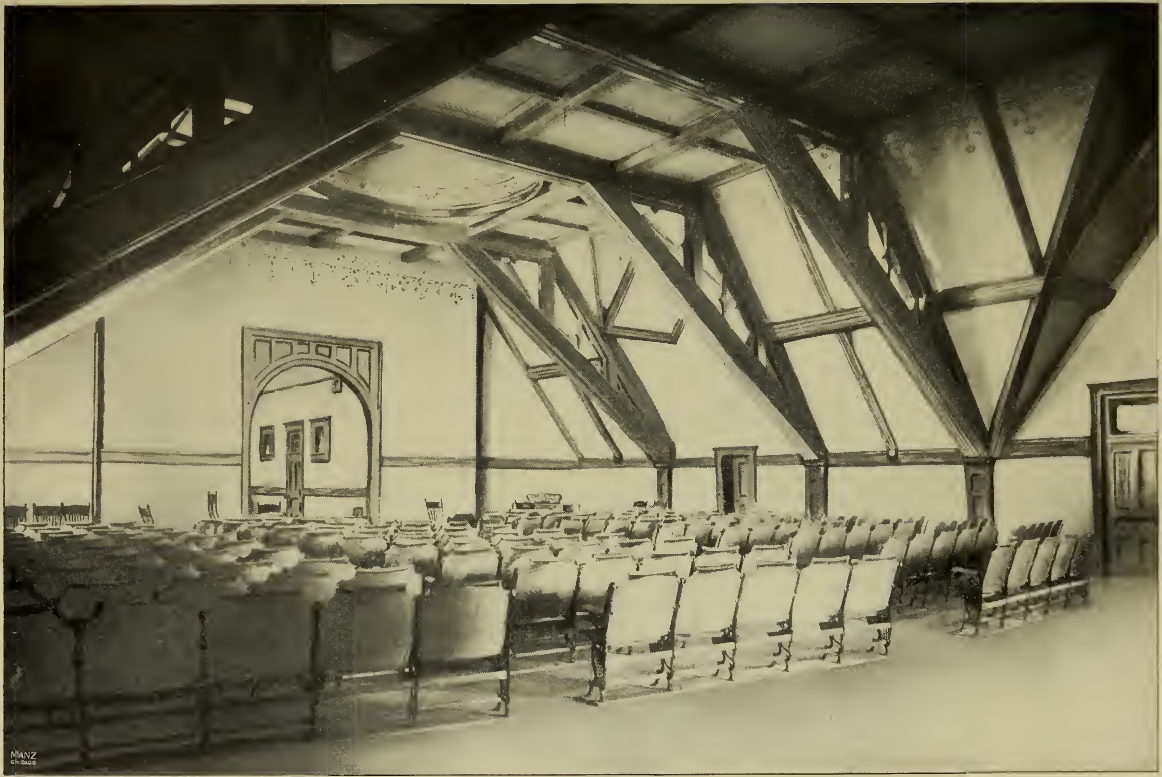
DIRECTOR S. M. EMERY.

FIRST YEAR:—Instruction in Horticulture will be given by lectures, laboratory practice and field work.

Special attention will be given to the various methods of propagation: by seeds, cuttings, layers, buds and grafts. Sélection of sites for orchards and small fruit plantations, with reference to suitable exposure, character of soil, etc. will receive careful consideration; also the preparation of soil, its proper fertilization and the rotation of crops thereon, pruning and irrigation.

Winter protection for trees and plants will be a specialty. Instruction will be given in commercial marketing of fruits, assorting and packing, also the construction of fruit packages.

Kitchen Gardening will embrace the selection and adaptation of varieties of vegetables, and esculent roots to the various sections of Montana; the construction and operation of green houses, hot-beds, cold frames and forcing houses; seed testing, methods of planting and cultivation, the winter care of vegetables, etc.



Assembly Room

LIBRARY
OF THE
UNIVERSITY of ILLINOIS.

Second Year:—Landscape Gardening. Under this branch will be taught the selection and propagation of shade and ornamental trees, shelter belts, shrubs, vines, flowerering plants and lawn grasses, best modes of planting and cultivating; the arrangement of lawns, roads, and drive-ways, their construction and care.

The orchard, nursery and small fruit plantations upon the grounds of the Experiment Station, contiguous to the College grounds, afford excellent opportunity to gain practical ideas of horticulture, and students in this branch can acquire a good working knowledge of fruit culture and ornamental planting.

BIOLOGY.

Dr. E. V. Wilcox.

Economic Entomology.—The life-history and habits of the different orders of insects will be treated in lectures so as to enable the student to appreciate the reason for adopting various methods for restraining injurious insects. The external anatomy of insects will be taught by lectures and dissections so that the student may recognize the orders and know what sort of treatment to apply in any particular case of insect attack. Special consideration will be had of the most noted and destructive insect enemies of various farm and garden crops, as well as of domestic animals, houses and articles of food. Several lectures will treat of insect-control and the natural and artificial remedies against noxious insects.

Veterinary Pathology.—Comparative animal physiology. Functions of special organs. Specific, general and contagious diseases of animals. Pathological physiology and anatomy of organs. Diagnosis of diseases. Surgical and medical treatment of diseases. In the study of diseases and their treatment the student will have opportunity to see and assist at numerous operations on cases brought for treatment.

CHEMISTRY.

DR. F. W. TRAPHAGEN.

Inorganic Chemistry.—An elementary course in Inorganic Chemistry, including such laboratory work as may be necessary, will be given in the second year, for the purpose of rendering the student familiar with those principles of this science with which an agriculturist should be acquainted.

Organic Chemistry.—The principal classes of organic compounds will be briefly studied, attention being given to the methods of preparing them, and the relations existing between the different groups. The distinctions between food principles, with reference to their uses, relative value, etc., will be carefully considered.

Agricultural Chemistry.—The work in this subject will have special reference to the applications of chemistry to agricultural science, and attention will be given to the various souces of plant food and the methods in use for making them available and for preserving them in the soil. A study of the useful constituents of the soil will be made at this time.

Carpentry and Forge Work.—The same as described under the Mechanical Engineering course.

Practical Steam Engineering.—The same as in Agricultural course.

DEPARTMENT OF MUSIC.

PIANO.

Miss Kate Calvin.

In this course special attention is given to thorough technique, and correct interpretation with practical analysis of rhythm and form.

Selections from the following Course in Piano will be given according to the ability of the student.

Instruction in Theory and History of Music will be free to all members of the Piano Department.

Jadassohn and Emery's Harmony will be used, and those wishing to take a complete Course in Piano must pass examination in Harmony.

Frequent recitals will be given by the students for the purpose of acquiring confidence in playing at public concerts. Pupils will also receive special training in memorizing and sight-reading.

Pupils not capable of advancement will not be encouraged to continue the lessons. Nothing is more unpardonable than for a teacher to permit a pupil to continue work where success can be only partial. Such pupils spend time and money altogether in vain.

No definite time can be fixed for completing this course. Some will make more rapid progress than others, and accomplish in four years, what would take others six or eight years to finish.

Students who have done satisfactory work, and passed the required examinations will be granted Diplomas.

COURSE OF STUDY.

FIRST YEAR.

Fundamental Technique; selections from the five finger exercises of Louis Kohler. Melodious. Exercises. Enckhausen, Book I. Duvernoy op. 176, Books 2 and 3. Czerny's Studies, revised by Germer, Book I, Part I. Selection from Easier Sonatine and Sonatas of Clementi, Kuhlau, Mozart and Haydn.

SECOND YEAR.

Daily Technique; Czerny, Germer Studies, Books 1 and 2; Major and Minor Scales. Heller op. 47, Book 2; Felix Le Couppey, op. 20 and op. 26; Loeschorn's School of Velocity, Books 1 and 2. 12 Kleine Praludien, Bach. Miscellaneous Classics from Mozart, Haydn, Beethoven, Schumann and Mendelssohn.

THIRD YEAR.

Daily Technique; German Studies, Book 2; School of Velocity, Loeschorn, Books 2 and 3; Two Voice Inventions, J. S. Bach; Concertos, Mozart; Easier ones of Beethoven. Miscellaneous Classics; Sonatas of Hummel, Nocturns—Nos. 3 and 5, Field; Selections by Bach, Mozart, Handel, Beethoven, Schubert, Mendelssohn, Schumann, Chopin; also from Greig, Godard, Scharwenkas, Paderewski and other modern composers.

FOURTH YEAR.

Daily Technique Studies; Moscheles op. 70, op. 25; Cramer op. 84; Czerny's Virtuoso School, Book 1 op. 365; Fugues by Bach; Czerny's School for the Left Hand, op. 718; Gradus by Clementi; Concertos, Mendelssohn and Beethoven; Miscellaneous Classics; also selections from modern composers.

TUITION.

Fall Term, one lesson per week	$13.00
Winter Term, one lesson per week	13.00
Spring Term, one lesson per week	10.00
Total	$36.00
Fall Term, two lessons per week	$23.30
Winter Term, two lessons per week	23.30
Spring Term, two lessons per week	18.00
Total	$64.60

Harmony for five or more students, $15.00 for the entire Academic year, (one lesson a week.).

Piano Rent.—Two periods each day, $10.00 per year.

Special Regulations.—No allowance can be made for omitted lessons except in case of protracted illness, and notice having been received as early as the day before the lesson day.

GENERAL INFORMATION.

FEES AND DEPOSITS.

Preparatory, or any College Course, per year	$10.00
Short Course in Agriculture, per year	5.00
Physical Apparatus (deposit)	5.00
Freshman Chemistry (deposit)	15.00
Quantitative Apparatus (deposit)	25.00
Assaying Apparatus (deposit)	30.00
Mineralogy, including Apparatus and 175 Minerals	10.00
Shop Courses (deposit per year), Wood Work	5.00
Shop Courses (deposit per year), Iron Work	7.00
Deposit for Art Work (per Year)	2.00
Domestic Science, Cooking Course, per term	1.00
Botanical Laboratory, per term	1.00
Zoological Laboratory, per term	1.00

All fees and deposits must be paid in advance to the Secretary of the Faculty. Students will not be permitted to enter classes until such payments have been made.

At the end of the term the student may return such apparatus as has not been damaged and receive in return the balance of his deposit less the cost of materials.

General Expenses.—There are no dormitories connected with the College. Students can find rooms and board in private families. Good homes can be obtained at very reasonable rates. Board and room may be had for fifteen dollars per month and upwards. Students may lessen expense by forming clubs.

Students are required to board in places approved by the Faculty.

New Students.—Students intending to enter the College are requested to notify the President or some member of the Faculty, a few days before coming to Bozeman.

Attendance.—Prompt attendance at all recitations, lectures and regular exercises of the College is required of every student.

Students are expected to attend the weekly Assembly, at which lectures are delivered by members of the Faculty and others.

Students whose absences exceed five per cent. of the total number of recitations or lectures, in any subject, will not be allowed to take the regular examinations in that subject without presenting a satisfactory excuse to the Faculty.

Examinations.—Frequent examinations are required of every student, so that the standing of each student may be readily ascertained at any time.

Reports are mailed to parents at the end of each term.

Special Students.—A certain amount of latitude in selecting studies will be allowed to special students, although any departure from the regular prescribed courses will be discouraged as a rule. Students desiring to take special courses must first obtain the consent of the Faculty, and their choice of subjects must be made to conform to the schedule of class work, which will be published before the beginning of each term.

Government.—Students are expected to conduct themselves as ladies and gentlemen; those who fail to comply with this demand will be requested to leave the institution.

Students must not leave the institution without reporting to the President, either in person or by writing. Any student transgressing this rule is thereby suspended from College; he will not be readmitted another term or year, nor will any reports or grades in credit for work done here be sent to him until a satisfactory explanation is made.

The work of each student is under the direct supervision of some member of the Faculty called a Class Officer.

LITERARY SOCIETIES.

Two successful literary societies, the Arena, and the Cliolian, exist under the auspices of the College.

They are given the benefit of the Faculty's co-operation to the fullest extent possible, one of its representatives being present at every meeting to give aid by counsel and suggestion. All students are encouraged to join one of these societies. Under this system great progress has been made.

Some of the features of the work of these societies are joint debates and literary contests.

THE COLLEGE EXPONENT.

This is a monthly journal, maintained by the students, and serves to give valuable training in English to the members of the editorial board and contributors, besides being the means of bringing the work of the College before a large body of subscribers throughout the state.

ATHLETICS.

Believing in the importance of athletics in their relations with College work, field sports and gymnasium practice are encouraged. Each year during commencement week one day is set aside for athletic contests. Great interest has centered in this day in the past, and the excellent health possessed by the students is attributable, in large part at least, to the systematic exercise taken in preparation for these events.

The arrangements for Field Day sports, for baseball, football and basket ball games, including practice, are in the hands of the Athletic Association, composed of students and members of the Faculty.

LIBRARY.

The Library occupies two large well-lighted rooms, on the first floor of the Main Building, and contains about 3,700 well selected volumes and about 2,500 pamphlets. Its shelves are well supplied with the standard works of History, Science and Literature. About $1,200 is spent yearly on books and magazines.

The Reading Room is furnished with the following Journals, Periodicals and Magazines:

American Chemical Journal,
American Dairyman,
American Electrician,
American Geologist,
American Journal of Science,
American Kitchen Magazine,
American Machinist,
American Veterinary Review,
Analyst,
Anatomischer Anzeiger,
Annals of Botany,
Astronomical Journal,
Atlantic Monthly,
Berichte der Deutschen Chem. Ges,
Botanical Gazette,
Botanisches Centralblatt,
Breeders' Gazette,
Bulletin of Am. Acad. of Med.
Bulletin of the Torrey Bot. Club,
Cassier's Magazine,
Century Magazine,
Chemical News,
Collier's Weekly,
Cosmopolitan,
Delineator,
Education,
Educational Forum,
Educational Review,
Electrical Review (N. Y.),
Electrical World and Engineer,
Electrician (London),
Engineering (London),
Engineering Magazine,
Engineering Mechanics,
Engineering News,
Engineer's Magazine,
Experiment Station Record,
Farmer,

Farming,
Field and Farm,
Forest Leaves,
Forum,
Good Health,
Good Housekeeping
Good Roads,
Harper's Bazaar,
Harper's Magazine,
Harper's Weekly,
Heating and Ventilation,
Homestead,
Household News,
Irrigation Age,
Jahresbericht uber d. Fort. der Chem. etc.,
Journal of American Chem. Soc.,
Journal of Comp. Medicine,
Journal of the Inst. of Elec. Eng.,
Journal of the Mil. Serv. Inst.,
Journal of London Chem. Soc.,
Journal of Morphology,
Journal of Pedagogy,
Knowledge,
Ladies' Home Journal,
Library Journal,
Literary News,
Locomotive Engineering,
Machinery,
McClure's Magazine,
Medicine,
Monthly Weather Review,
Munsey's Magazine,
National Stockman and Farmer,
Nature,
North American Review,
Northwestern Journal of Education,
Northwest Magazine,
Orange Judd Farmer,
Outing,
Patent Office Gazette,
Popular Science Monthly,
Poultry Monthly,
Power,
Publishers' Weekly,
Review of Reviews,
Rural New Yorker,
School of Mines Quarterly,
Science,
Science Gossip,
Scientific American Supplement,
Scribner's Monthly,
Sound Money,
Southern State Farm Magazine,
Street Railway Review,
Sunshine,
Table Talk,
The Dial,
Transactions Amer. Inst. E. E.,
Transactions Amer. Inst. Min. E.,
Transactions Amer. Soc. C. E.,
Transactions Amer. Soc. Mech. E.,
Transactions Assoc. Eng. Socs.,
Transactions West. Soc. of Engrs.,
Veterinarian,
Veterinary Archives,
Veterinary Journal,
Veterinary Magazine,
Woman's Home Companion,
Youth's Companion,
Zeitschrift fur Anal. Chem.,
Zoologischer Anzeiger,
Zoologist.

The Reading Room is also supplied with the following daily and weekly newspapers, most of them being donated:

Avant Courier,
Belt Valley Times,
Benton River-Press,
Big Timber Pioneer,
Boulder Age,
Bozeman Chronicle,
Butte Miner,
Farmer's Voice,
Great Falls News,
Helena Herald,
Helena Independent,
Indiana Farmer,
Inter Lake,
Inter Mountain,
Livingston Post,
Madisonian,
Montana Fruit Grower,
Mountaineer,
Neihart Herald,
Northern Agriculturist,
Rocky Mountain Husbandman,
St. Paul Dispatch,
Salt Lake Tribune,
Townsend Messenger.

DEGREE CONFERRED.

COMMENCEMENT, JUNE 1898.

BACHELOR OF SCIENCE.

Reno H. Sales	Bozeman.

CATALOG OF STUDENTS, 1898-99.

THE COLLEGE.

SENIORS.

Caldwell, Thomas O	Spring City, Tenn.	Chemistry.
Williams, Frank B	Wickes	Mech. Engineering.

JUNIORS.

Cockrill, Irvin	Bozeman	Chemistry.
Freeman, Beatrice M	Bozeman	General Science.
Maynard, Edna	Ennis	General Science.

SOPHOMORES.

Jones, Wyatt W	Myersburg	General Science.
Koch, Elers	Bozeman	General Science.
Monforton, Zoe	Bozeman	Home Science.
Sloan, William F	Bozeman	Elect. Engineering.
Titus, N. C. Jr	Miles City	Chemistry.
Willson, Frank G	Bozeman	Mech. Engineering.
Waters, Herman B	Bozeman	Elect. Engineering.

FRESHMEN.

Brandenburg, Wm. E	Bozeman	Mech. Engineering.
Burk, Edmund	Bozeman	Chemistry.
Collins, Walter E	Helena	Elect. Engineering.
Cowan, Vina M	Bozeman	General Science.
Chisholm, Robert B	Bozeman	General Science.
Freeman, William B	Bozeman	General Science.
Hutton, Charles F	Ennis	General Science.
Jeffers, Clifford J	Ennis	General Science.
Moore, Ellie, J. S	Belgrade	General Science.
Quaw, Marguerite M	Bozeman	General Science.
Reese, Herbert J	Livingston	Mech. Engineering.
Simons, N. William	Spring Hill	Chemistry.
Schabarker, Willard W	Bozeman	Mech. Engineering.
Spragg, Frank A	Denton	Agriculture.
Thompson, Homer C	Bozeman	General Science.

SPECIAL.

Ballinger, Florence	Livingston	Domestic Science.	
Blankinship, Claire F	Bozeman	Art.	
Boyles, Ralph	Bozeman	Chemistry.	
Corcoran, Evelyn	Bozeman	Domestic Science.	
Cook, Geneva G	Bozeman	Domestic Science.	
Fuller, Columbus C	Bozeman	Chemistry.	
Gardner, Mattie J	Bozeman	Art.	
Hansen, Henry C	Canyon Ferry	Chemistry.	
Jeffers, Bertha F	Ennis	Domestic Science.	
Jeffers, Altha M	Ennis	Domestic Science.	
Kuphal, Henry E	Helena	Chemistry.	
Lewellen, John D	Gallop	Mental Science.	
Penwell, Della M	Belgrade	Art.	
Penwell, Florence I	Belgrade	Art.	
Robinson, Edna F	Bozeman	Art.	
Robinson, Leonora	Bozeman	Domestic Science.	
Shaw, Howard I	Gilt Edge	Chemistry.	
Waite, P. C	Bozeman	Chemistry.	
Wylie, Elizabeth	Bozeman	Art.	46

PREPARATORY DEPARTMENT.

THIRD YEAR.

Arnold, Annie G	Bozeman.
Bronner, Laura G	Meadow Creek.
Black, Nina	Jefferson Island.
Davidson, Jesse	Bozeman.
Davidson, Polly G	Bozeman.
Dickson, Pearl	Bozeman.
Flaherty, William A	Cold Spring.
Flaherty, Charles D	Cold Spring.
Henry, Merrill	Livingston.
Harvey, Minnie	Townsend.
Jones, Burle J	Bozeman.
Kinney, Edward D	Bozeman.
Koch, Stanley	Bozeman.
Marshall, Rosa	Bozeman.
Martin, James E. Jr	Bozeman.
Maxwell, Seth	Townsend.
McMahon, Austin B	Townsend
Miller, Nelson W	Merrill.
Monforton, J. B	Bozeman.
Morse, Allen G	New Chicago.
Provinse, W. D	Roberts.
Stafford, Isaac S	Pony.
Sparr, Wilbur W	Belgrade.
Street, William B	Bozeman.
Trent, Harlem H	Bozeman.
Tavenner, Frank L	Ubet.
Wisner, Edith M	Bozeman.
Wynne, Sedman W	Manila.

SECOND YEAR.

Arnold, Ella M	Bozeman.
Badgley, Ordell	Bozeman.
Badgley, Necy Ann	Bozeman.
Black, Lilly	Jefferson Island.
Black, Jennie	Jefferson Island.
Chalmers, William R	Centerville, Ore.
Crouse, Minnie C	Spring Hill.
Cook, Margaret G	Bozeman.
Davidson, Edward W	Bozeman.
Daniels, Harry M	Canton.
Francisco, Adelia B	Sixteen Mile.
Hunter, Nylette M	Pony.
Hind, Ethel	Pony.
Holmgren, Gus	Merrill.
Locke, Jerome	Livingston.
Lockey, Will	Troy, Neb.
Lewis, Clyde E	Crow Agency.
Lang, Jeanetta E	Logan.
Moore, Icie E. B	Belgrade.
Park, Preston H	Belgrade.
Peat, John A	Lima.
Patterson, Jennie T	Manhattan.
Penwell, Carrie C	Belgrade.
Provinse, Edgar W	Roberts.
Scholten, Belinda D	Wormser.
Snider, Pinkerton	Bozeman.
Thompson, Charles A	Bozeman.
Woodward, Grace J	Willow Creek.
Yahn, Albert B	Belgrade.
Young, John T	Joliet.

FIRST YEAR.

Carmin, Charles	Pony.
Coursien, Frankie	Bozeman.
Day, J. W	Bozeman.
Freeland, Mabel L	Bozeman.
Fisher, Bertram	Pony.
Fisher, Laura	Pony.
Hopkins, Helen	Melville.
Hankinson, Francis	Willow Creek.
Harvey, William M	Townsend.
Holgate, Ralph C	Manhattan.
Hutton, Horace P	Ennis.
Huffine, Roe P	Bozeman.
Huffine, Floyd	Bozeman.
Jackson, Edith H	Harrison.
Jackson, Rollin H	Harrison.
Jackson, Faith L	Harrison.
Manley, William C	Townsend.
Penman, William	Bozeman.
Philips, John N	Utica.
Penwell, Clyde	Belgrade.
Ridpath, Clarence	Virginia City.
Rouse, Claude Dee	Bozeman.

Tracy, Frank	Bozeman.	
Young, Charles	Joliet.	

SPECIAL.

Albro, Nellie	Bozeman.	
Altman, Betty	Bozeman.	
Armstrong, Mamie V	Kansas City, Mo.	
Allen, Mary L	Bozeman.	
Austin, Geraldine	Bozeman.	
Buchler, Mrs. M	Bozeman.	
Cameron, Jeanette	Bozeman.	
Ferris, Margaret M	Arco, Idaho.	
Grierson, Henry	Rancher.	
Green, Jennie M	Bozeman.	
Gardner, Carrie P	Bozeman.	
Johnson, John A	Bozeman.	
Kolble, Annie	Bozeman.	
Kenyon, Ursula	Absarokee.	
Knadler, Edwin S	Belgrade.	
Martin, Alice	Bozeman.	
Moore, Gertrude M	Belgrade.	
Morris, Weldon B	Florence, Idaho.	
Noble, Buenos	Jefferson Island.	
Noble, Laviga	Jefferson Island.	
Parker, Charles C	Garnet.	
Patterson, Blanche A. W	Manhattan.	
Philips, Mattie E	Utica.	
Pease, Ethel	Bozeman.	
Pease, Nellie	Bozeman.	
Traphagen, Gertrude	Bozeman.	
Vogel, Jacob	Salesville.	
Wylie, Fred	Bozeman.	
Wood, James L. Jr	Radersburg.	
Waters, Mary	Bozeman.	
Wylie, Mary G	Bozeman.	113

SHORT COURSE IN AGRICULTURE.

Everson, William	Bozeman.	
Herron, Clarence	Bozeman.	
Kruse, Jacob	Bozeman.	
Melton, Eli	Belgrade.	
Osborne, O. C	Bozeman.	
Robinson, William	Bozeman.	
Robinson, Lester	Bozeman.	7

BUSINESS DEPARTMENT.

BOOK-KEEPING.

Arnold, James W	Bozeman.
Arnold, Louis G	Bozeman.
Chrisman, Daisy	Elk City, Kan.
Conrow, Carruth G	Bozeman.
Darlington, George	Logan.
Dickson, William S	Philbrook.
Davis, Wilbur	Belgrade.

Davis, Evan B.	Bozeman.	
Davis, Mattie	Bozeman.	
Davis, Fred T.	Columbus.	
Edsall, Ernest S.	Bozeman.	
Elliot, J. A	Highfield.	
Esgar, Frank H	Bozeman.	
Godson, Eliza	Bozeman.	
Gage, Lucy E.	Bozeman.	
Hossfeld, George	Radersburg.	
Hensley, Edwin E. E	Butte.	
Hancock, Helen	Bozeman.	
Henderson, Claud A.	Bozeman.	
Jeffers, Walter Clarence	Ennis.	
Jones, Orville	Bozeman.	
Ketterer, August E	Bozeman.	
Kreiling, Anna M	Bozeman.	
Kountz, John	Bozeman.	
Knadler, Willard	Belgrade.	
Kent, Laura E.	Bozeman.	
Luce, Laura E.	Bozeman.	
Lansing, Gerald W	Bozeman.	
Martin, Horace R.	Bozeman.	
Maynard, Louis I.	Bozeman.	
Mileham, Ellery	Bozeman.	
Miller, John O	Merrill.	
Morgan, Frank T.	Gallop.	
Morgan, Emile C	Bozeman.	
Morgan, Gertrude I.	Bozeman.	
Otten, Herman C.	Cottonwood.	
Parkins, William E.	Sheridan.	
Proffitt, Carrie M.	Bozeman.	
Reese, Evan	Bozeman.	
Roberts, George	Harrison.	
Roland, Gertrude F.	Logan.	
Smith, Jessie L.	Joliet.	
Swift, T H.	Townsend.	
Steffens, Claud P.	Bozeman.	
Tracy, Albert	Bozeman.	
Van Tassell, Chas	Bozeman.	
Walker, Mattie	Bozeman.	
Wise, Amos	Cooke City.	
Wemyss, Alexander L. W.	Bozeman.	
Williams, David F.	Radersburg.	

ADVANCED BOOK-KEEPING.

Brooks, Willie	Bozeman.	
Cowan, Flonette	Bozeman.	
Lehrkind, Henry	Bozeman.	
Lyons, Walter H.	Bozeman.	
Railey, Mary E.	Bozeman.	

STENOGRAPHY AND TYPEWRITING.

Brassey, W. E.	Lewistown.	
Cummings, Edna E.	Bozeman.	
Monforton, Mary A.	Bozeman.	
Matthews, Curtis	Bozeman	59

MUSIC.

Alward Coda	Bozeman.	
Anderson, Vera	Bozeman.	
Chisholm, Alice	Bozeman.	
Chisholm, Perry	Bozeman.	
Chisholm, Robert	Bozeman.	
Chrisman, Daisy	Elk City, Kan.	
Cowan, Vina	Bozeman.	
Coursien, Frankie	Bozeman.	
Flowers, Stella	Bozeman.	
Flowers, Blanche	Bozeman.	
Francisco, Belle	Sixteen Mile.	
Freeman, Beatrice	Bozeman.	
Gardner, Carrie	Bozeman.	
Gottschalk, Ellen	Bozeman.	
Griffin, Grace	Bozeman.	
Hanson, Nina	Bozeman.	
Hancock, Helen	Bozeman.	
Holgate, Ralph	Manhattan.	
Hills, Mamie	Bozeman.	
Jackson, Faith	Harrison.	
Jeffers, Bertha	Ennis.	
Jeffers, Paul	Ennis.	
Luce, Gertrude	Bozeman.	
Moore, Gertrude	Belgrade.	
Nichols, Ernestine	Bozeman.	
Parkins, Hattie	Sheridan.	
Patterson, Lois	Manhattan.	
Pease, Ethel	Bozeman.	
Pease, Nellie	Bozeman.	
Quaw, Minnie	Bozeman.	
Ruffner, Olla	Bozeman.	
Statts, Carrie	Bozeman.	
Stanton, Grace	Bozeman.	
Stuve, Lizzie	Bozeman.	
Van Allen, Janet	Bozeman.	
Williams, Carrie	Bozeman.	
Work, Vida	Bozeman.	
Wylie, Grace	Bozeman.	
Yerkes, Beulah	Bozeman.	
Yerkes, Paul	Bozeman.	41

SUMMARY.

College	46
Short Course in Agriculture	7
Preparatory Department	113
Business Department	59
Total, not including Music Students,	225

INDEX.

PAGE
Accredited High Schools... 79
Admission Requirements... 79
Agricultural Course... 36-42
Art, Courses in... 29
Athletics... 104

Bacteriology... 47
Book-keeping, Courses in... 89-91
Botany, Courses in... 46
Buildings... 10
Business Department... 89

Calendar... 2
Catalog of Students... 106
Chemistry, Course in... 50-57
College Exponent... 103
Course of Reading, Preparatory Department... 88
Course of Study in—
  Agriculture (Long)... 36
  Agriculture (Short)... 93
  Art... 29
  Biology... 43
  Book-keeping... 89
  Book-keeping (Post Grad.) 91
  Chemistry... 50
  Electrical Engineering... 73
  General Science... 20
  Home Science... 58
  Mechanical Engineering.. 62
  Music... 100
  Preparatory Department. 83
  Stenography, Typewriting 92
Crystallography... 32

Degrees, Advanced... 80
  Baccalaureate... 80
Degrees Conferred, 1898... 106
Drawing, Mechanical... 69
  Preparatory... 86
Economics... 34
Electrical Engineering Course... 73-77
Endowment... 7
English... 25
Equipment... 10
Executive Board... 4
Experiment Station... 8
Experiment Station Staff... 6

Faculty... 5-6
Fees and Deposits... 101
Forest Reserve... 81
French... 27

PAGE.
Gallatin Forest Reserve... 81
Geology, Courses in... 34
General Expenses... 102
General Information... 101
General Statement... 9
General Science Course... 20-35
German... 27

History of the College... 7
History, Courses in... 26
Home Science Course... 58-61
Horticulture, Courses in... 42, 96

Irrigation, Course in... 40

Laboratory, Assay... 14
  Biological... 18
  Chemical... 11
  Engineering... 16
  Physical... 11
Latin, Courses in... 26
Library... 104
Literature, Courses in... 25
Literary Societies... 103

Machine Design... 69
Main Building... 10
Mathematics, Courses in... 27
Material Equipment... 10
Mechanics, Courses in... 67
Mechanical Drawing... 69
Mechanical Engineering Course... 62-72
Mental and Moral Science.. 33
Military Science... 78
Mineralogy, Collections in.. 15
Mineralogy, Course in... 32
Music Department... 99

Periodicals... 105
Preparatory Department... 102
Physics, Courses in... 28

Requirements for Admiss'n 79

Shop Building... 12
Shops, Equipment... 15
Shop Work, Courses in... 70
Shorthand and Typewriting 92
State Board of Education.. 3
Steam Engineering, Courses in... 68
Surveying... 35

Veterinary Science... 41

Zoology, Courses in... 40

UNIVERSITY OF ILLINOIS-URBANA
3 0112 112219545